The Effect of Product Density on Perceived Price and Quality

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The Effect of Product Density on Perceived Price and Quality

by

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Abstract

This study explores whether product density affects crowding, perceived quality, and perceived price of products within the retail space. The goal is to determine whether product density directly affects customers’ perceptions of price and quality of merchandise within retail spaces. It tests the hypotheses that increased product density will lead to an increase in crowding perceptions but a decrease in perceived price and quality. The study uses photographs of retail spaces with differing densities to manipulate product density and an online questionnaire to gather data. A student sample is used to collect the data. ANOVAs are used to determine the relationships between product density and perceived crowding, quality, and price. The hypothesis of increased crowding perceptions with increased density is partially supported, but the other hypotheses are not supported.

Key Words: product density, crowding, price, quality, perception, merchandising
Acknowledgements

I would like to thank my thesis advisor, Dr. Jamye Foster, for her tireless assistance through this entire process. Thanks to Dr. Leisa Flynn and Dr. Melinda McLelland for their inputs into my survey and photo selection. I would like to thank Dr. Melinda McLelland, Dr. Gallayanee Yaoyuneyong, and Mrs. Dolly Loyd for helping disseminate my survey. My sincere thanks goes out to all of the Marketing and Fashion Merchandising Staff who participated in my expert questionnaire pretest. Also, special thanks to Jason, Adam, and Anna at CLICK Boutique in downtown Hattiesburg and Mrs. MeLinda Shaw at MeLinda’s Fine Gifts in Picayune for allowing me to rearrange and photograph their stores for my study.

I would like to express my gratitude as well to all of my instructors at The University of Southern Mississippi for their support and instruction during my years at this university, and a very special thanks to my family for their financial and emotional support during this project and all of my life. This project would not have been possible without all of this support.
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List of Abbreviations

ANOVA  Analysis of Variance
USM    The University of Southern Mississippi
Chapter 1: Introduction

Have you ever entered a store and immediately felt crowded? Or have you walked into a retail space that felt empty? Undoubtedly the density of products affected the way you shopped within either of these scenarios. In a packed space, you may have been overwhelmed by the myriad of products displayed, or you may have taken the cramped nature as a sure signal that bargains awaited. Similarly, you may have subconsciously assumed that the goods within were low quality because of the way they were presented. In a low-density space, you may have been turned off immediately because of the fear of high prices. On the other hand, you may have assumed the products in the store were high quality and deserved individual attention. In any of these situations, the density of the products displayed within possibly influenced your perception of the price and quality of those products.

Spatial crowding is a phenomenon experienced frequently in shopping. It occurs “when the retail environment is judged to be dysfunctionally dense” (Eroglu, Machleit, and Chebat, 2005, p. 578). In other words, spatial crowding occurs when a shopper feels that he or she cannot shop properly due to the excess of products in the space. For example, a spatially crowded space contains so many products that the customer fears inadvertently brushing merchandise while trying to shop. Density, therefore, is the quantifiable aspect that is directly related to the subjective perception of crowding (Eroglu, Machleit, and Chebat, 2005). The proposed study will examine the product density aspect of spatial crowding, which has yet to be directly examined. The literature on spatial crowding has considered the impact on several consumer outcome variables, such as shopping satisfaction (Machleit, Eroglu, and Mantel, 2000; Li, Kim, and Lee,
2009; Machleit, Kellaris, and Eroglu, 1994); arousal, dominance, and/or pleasure (Li, Kim, and Lee, 2009; Machleit, Eroglu, and Mantel, 2000); and purchase intentions and attitude toward the store (Pan and Siemens, 2011). However, a study has yet to examine the effect of spatial crowding on perceived quality and perceived price. Because quality and price are integral to success in today’s market, this study will focus specifically on the effect of product density within a retail store on the consumers’ perception of product quality and price.

In today’s competitive market, it is harder than ever to achieve success. Every aspect of a business must be well planned in order to withstand the competition. Details that may seem insignificant send signals to consumers. A study by Cant and Hefer (2012) found that visual merchandising enriched consumers’ shopping experience and played a part in their perception of the quality of the merchandise in the store (p. 1493). The current study is significant because it relates product density to two previously unrelated consumer outcomes: perceived quality and perceived price. This relationship has implications for store layout and merchandising; a store’s floor plan and its intended quality and price perceptions need to align in order to avoid consumer confusion. The information garnered from this study will help fill a hole in the literature and assist marketers to create the best retail environments possible by determining the relationship between product density and perceived product quality and price.

Chapter 2: Review of the Literature

The proposed study considers the impact that product density has on spatial crowding, and ultimately perceptions of price and quality. First, the key constructs of this research will be defined. Then, the research on spatial crowding will be discussed,
followed by a specific element of spatial crowding—product density. Lastly, the relevant research on perceived quality and price will be outlined.

Table 1: Definitions of Key Constructs

<table>
<thead>
<tr>
<th>Construct</th>
<th>Citation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crowding</td>
<td>Eroglu and Machleit, 1990, p. 203</td>
<td>“A state of psychological stress that results when one’s demand for space exceed the supply.”</td>
</tr>
<tr>
<td>Spatial Crowding</td>
<td>Li, Kim, and Lee, 2009, p. 639</td>
<td>“Feelings of restricted physical body movement due to high spatial [product] density.”</td>
</tr>
<tr>
<td>Density</td>
<td>Eroglu, Machleit, and Chebat, 2005, pp. 578-579</td>
<td>“The number of people and objects in a limited space” and the “root cause” of crowding</td>
</tr>
<tr>
<td>Product Density</td>
<td>Machleit, Eroglu, and Mantel, 2000, p. 30</td>
<td>“The amount of merchandise and fixtures” in a given space.</td>
</tr>
<tr>
<td>Perceived price</td>
<td>Chang and Wildt, 1994, p. 18</td>
<td>“The consumer’s perceptual representation or subjective perception of the objective price of the product.”</td>
</tr>
<tr>
<td>Perceived quality</td>
<td>Aaker, 1991, p. 88</td>
<td>“The customer’s perception of the overall quality or superiority of a product with respect to its intended purpose, relative to alternatives”</td>
</tr>
</tbody>
</table>

Spatial Crowding

Eroglu and Machleit (1990) define perceived crowding as “a state of psychological stress that results when one’s demand for space exceed the supply” (p. 203). When customers perceive that the store, or any space, lacks the space necessary to successfully carry out their intended activities, they feel crowded (Machleit, Eroglu, and Mantel, 2000, p. 30). So, crowding is the affective outcome of a high-density space (Eroglu and Machleit, 1990, p. 217). Crowding has two dimensions that can be reliably differentiated: social crowding and spatial crowding (Machleit, Kellaris, and Eroglu, 1994, p. 188). Social crowding results from the perceived number of humans in an area as well as their level of interaction with each other. Spatial crowding, on the other hand, occurs because of “the amount of merchandise and fixtures as well as their configuration.
within the store” (Machleit, Eroglu, and Mantel, 2000, p. 30). Spatial crowding is therefore defined as “feelings of restricted physical body movement due to high spatial density” (Li, Kim, and Lee, 2009, p. 639).

Most of the literature represents the general consensus that spatial crowding has a net negative effect on shopping satisfaction (Machleit, Eroglu, and Mantel, 2000, p. 30; Li, Kim, and Lee, 2009, p. 644). In addition to its effects on satisfaction, spatial crowding has been shown to affect pleasure, arousal, and dominance negatively (Li, Kim, and Lee, 2009, p. 644). Because spatial crowding affects a myriad of consumer outcomes, the current study will determine whether product density, mediated by spatial crowding, affects perceived quality and perceived price of products within the retail space.

Given its subjective nature, spatial crowding is impossible to objectively measure. However, Eroglu and Machleit (1990) explain that “crowding is generally operationalized in terms of an objectively measurable variable: density” (p. 203). Similarly, Eroglu, Machleit, and Chebat (2005) explain that “density is the root cause of the crowding experience” (p. 579). Because density is the primary influencer of spatial crowding, it will be examined as the main construct in this study.

**Density**

Density is defined as “the number of people and objects in a limited space” (Eroglu, Machleit, and Chebat, 2005, pp. 578-579). Density is therefore quantifiable and objective, unlike crowding. As the number of items, or density, increases within a space, the likelihood that consumers will experience crowding also increases (Eroglu and Machleit, 1990, p. 204). High density, therefore, is more likely to lead to perceptions of crowding and affect consumer outcomes. In fact, high density has been shown to
negatively impact pleasure and approach behaviors for shoppers with low need for affiliation (van Rompay, Krooshoop, Verhoeven, and Pruyn, 2012, p. 1128). Because density causes perceptions of crowding (Eroglu and Machleit, 1990, p. 217), it can also be divided into two dimensions: product density and human density. The current study will focus only on the product density dimension. Product density, specifically, is defined as the “amount of merchandise and fixtures” (Machleit, Eroglu, and Mantel, 2000, p. 30) in a limited space, making it possible to reliably manipulate.

**Consumer Outcomes**

Research indicates that spatial crowding is generally viewed as negative from the consumer’s perspective (Michon, Chebat, and Turley, 2005; Eroglu, Machleit, and Chebat, 2005; Eroglu and Machleit, 1990), and that it impacts several consumer outcomes. Previous studies have found that high product density leads to crowding, which in turn affects consumer satisfaction (Machleit, Eroglu, and Mantel, 2000; Li, Kim, and Lee, 2009, p. 644), shoppers’ inclinations to enter the store, intention to browse, attitudes toward the store, and purchase intentions (Pan and Siemens, 2011, p. 108). The current study will attempt to determine whether product density, mediated by crowding, affects two new consumer outcomes: perceived quality and perceived price.

**Perceived quality**

Quality is vital in today’s market (Golder, Mitra, and Moorman, 2012). However, perceived quality is subjective. Signals such as brand, price, physical appearance, and retailer reputation affect a consumer’s perception of quality (Dawar and Parker, 1994, p. 91). General crowding (including both spatial and social) has been found to impact perceptions of quality through store perception (Pan and Siemens, 2011, p. 108; Michon,
Therefore, spatial crowding alone is expected to have some sort of impact on consumer perception of quality.

**Perceived price**

Almost everything has a price that “acts as a funnel, reflecting the overall favorability of a product’s attributes” (Yan and Sengupta, 2011, p. 377). Luxury brands with higher prices tend to use very low-density displays. Because of this, consumers may perceive that when the products are presented this way the price is higher. Price has been shown to affect perceptions of quality and vice versa (Yan and Sengupta, 2011, p. 377; Dawar and Parker, 1994, p. 88 and 92; Suri, Cai, Monroe, and Thakor, 2012, p. 171); therefore, since crowding is proposed to affect perceptions of quality, it is also proposed to affect perceived price.

**Table 2: Key Findings in the Literature**

<table>
<thead>
<tr>
<th>Area</th>
<th>Citation</th>
<th>Key Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density</td>
<td>van Rompay, Krooshoop, Verhoeven, and Pruyn, 2012, p. 1128</td>
<td>High density has a negative impact on pleasure and approach behaviors for shoppers with low need for affiliation.</td>
</tr>
<tr>
<td></td>
<td>Bertini, Wathieu, and Iyengar, 2012, p. 43-47</td>
<td>High density has a positive impact on the price a customer is willing to pay for a high quality product.</td>
</tr>
<tr>
<td>Crowding</td>
<td>Eroglu and Machleit, 1990, p. 217</td>
<td>Crowding results from a high-density environment.</td>
</tr>
<tr>
<td></td>
<td>Pan and Siemens, 2011, p. 108</td>
<td>Retail crowding has a significant effect on purchase intentions. The relationship is an inverted U shape with the purchase intention being greatest for medium crowding situations. Retail crowding also affects consumers’ attitudes toward the store.</td>
</tr>
<tr>
<td>Spatial Crowding</td>
<td>Machleit, Eroglu, and Mantel, 2000, p. 30</td>
<td>Results from high product density (“amount of merchandise and fixtures”).</td>
</tr>
<tr>
<td></td>
<td>Li, Kim, and Lee, 2009, p. 644</td>
<td>Has a negative impact on pleasure, arousal, and dominance, which have a positive impact on satisfaction. Net impact on satisfaction is therefore negative.</td>
</tr>
<tr>
<td></td>
<td>Machleit, Eroglu, and Mantel, 2000, p. 30</td>
<td>Has a negative impact on shopping satisfaction.</td>
</tr>
<tr>
<td></td>
<td>Eroglu, Machleit, and Barr, 2005, p. 1151</td>
<td>“The effect of perceived spatial crowding on satisfaction is nonsignificant.”</td>
</tr>
<tr>
<td>Perceived Quality</td>
<td>Michon, Chebat, and Turley, 2005,</td>
<td>Is positively affected by the perception of the</td>
</tr>
<tr>
<td>Perceived Price</td>
<td>Yan and Sengupta, 2011, p. 377</td>
<td>Has a positive impact on perceived quality in the absence of product attribute information.</td>
</tr>
<tr>
<td>----------------</td>
<td>-------------------------------</td>
<td>-----------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>

**Study**

This study will focus on the relationship between product density within the retail environment and customers’ perceptions of price and quality. The following model is proposed based on the existing literature:

![Diagram](image)

**Hypotheses**

A study conducted by Bertini, Wathieu, and Iyengar (2012) suggests that product proliferation (a high number of alternatives or brand options for a single item), a phenomenon somewhat similar to density, heightens a consumer’s appreciation for quality. While this study suggests that more options could heighten consumers’ appreciation for quality, the majority of research suggests that higher product density increases feelings of crowding (Eroglu and Machleit, 1990; Li, Kim, and Lee, 2009; Machleit, Kellaris, and Eroglu, 1994), which is expected to adversely affect consumer outcomes. Therefore, the following hypotheses are proposed:

H1: Higher (lower) levels of product density will increase (decrease) perceptions
of spatial crowding.

Luxury stores often have a common element in their designs: minimal product. Casual observation of high end, luxury retailers such as Nordstrom reveals that this type of retailer often has much lower product density than its lower-priced department store counterparts, such as TJMaxx. When a customer thinks of Nordstrom, he or she likely thinks of high-quality, highly-priced merchandise in a low-density retail environment. Conversely, when a customer thinks of TJMaxx, he or she probably conjures images of a cramped retail space with low prices and possibly low quality. For example, the handbag section in Nordstrom consists of a few handbags per display shelf, while the handbag section in TJMaxx consists of many handbags hanging on one or two racks. Although both retailers may contain the same quantity of handbags, the handbag section in Nordstrom is much larger than the handbag section in TJMaxx, making Nordstrom’s density lower. Because luxury retail spaces often have lower product density with higher prices and quality, the following is hypothesized:

H2: Higher (lower) levels of product density will negatively (positively) affect perceived product quality.

H3: Higher (lower) levels of product density will negatively (positively) affect perceived product price.

Chapter 3: Methodology

Research Design

A between subjects experimental design was used to test the hypotheses outlined above. Each respondent was exposed to a high, medium, or low-product-density image via Qualtrics (an online survey software) and then asked to complete a questionnaire.
Product density was manipulated using images representing high, medium, and low density. To make the study as scientific as possible, all of the photos within each category were the same except for the amount of product. As shown in Appendix A, the photos for each category maintained the same aspect ratio, point of view, type of merchandise, and overall setup. Only the number of items changed. The number of items was altered for each condition so that the difference would be readily noticeable.

The actual survey for the research consisted of a single photo from one density category and one type category (for example, a picture of high-density housewares or medium-density clothing), followed by a series of questions about price, quality, and spatial crowding. The measures used were adapted from previous research for the sake of reliability. Additionally, a question regarding perceived density of the photo was included as a manipulation check. The complete questionnaire is presented in Appendix B.

Sample

Although all shoppers are included in the overall population that this study intends to represent, a random sample of all shoppers was beyond the capabilities of this study. However, a large sample of students was available. Since students represent a very diverse group of individuals and encompass people of all ages, ethnicities, genders, and lifestyles, they are indicative of the overall population (Sheth, 1970). The sample included students enrolled in marketing or fashion merchandising classes in the College of Business on the Hattiesburg campus at USM during the Fall 2013 semester. The survey was entirely voluntary, although extra credit was offered by each of the three Marketing and Fashion Merchandising staff as a means to increase response rate. The sample was 34.6 percent male and 65.4 percent female with an average age of 23.31.
To increase the generalizability of this study, a low, medium, and high-density picture was selected for both housewares and clothing. Students were assigned to one of six surveys based on the class in which they were enrolled. Although six different photos were used in the study, only three conditions were tested: low, medium, and high density. Since there are only three conditions and ANOVAs will be used for analysis, only 30 participants per variable were needed—a total of 90 participants (VanVoorhis and Morgan, 2007, p. 48).

Procedure

In the fall semester of 2013, a pretest and subsequent questionnaire was administered via Qualtrics. The research was conducted using human subjects; therefore, IRB approval was sought and obtained prior to dissemination. A copy of the application and approval are presented in Appendix C.

In the first pretest, each respondent was presented with three photos of varying densities from each category and asked to rate the photos on a scale from very dense (1) to very sparse (6). This first pretest led to a change in the scale used—from a six-point scale to a seven-point scale because of the medium density classification. Similar to the first pretest, the second used 1 to represent “very dense” and 7 to represent “very sparse.” As shown in the table below, the pretest supported the classification of the images for the survey.

<table>
<thead>
<tr>
<th>Photo</th>
<th>Pretest Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-density clothing</td>
<td>1.71</td>
</tr>
<tr>
<td>Medium-density clothing</td>
<td>3.57</td>
</tr>
<tr>
<td>Low-density clothing</td>
<td>5.83</td>
</tr>
<tr>
<td>High-density housewares</td>
<td>1.86</td>
</tr>
<tr>
<td>Medium-density housewares</td>
<td>4.00</td>
</tr>
<tr>
<td>Low-density housewares</td>
<td>5.71</td>
</tr>
</tbody>
</table>
Because of the between-subject research design, each participant was given a single picture in his or her questionnaire. As such, there were six versions of the survey—high-density clothing, medium-density clothing, low-density clothing, high-density housewares, medium-density housewares, and low-density housewares. The surveys were self-administered via links sent out by several instructors. To prevent partial responses, the “force response” box was checked for each integral question in Qualtrics. Surveys consisted of a photo and questions regarding quality, price, crowding, and density. This order was used to prevent priming of the respondents by asking about the three dependent variables before asking about the independent variable. Results from the study were then exported to SPSS statistical software for analysis.

**Measures**

The independent variable, product density, was manipulated using photographs of three different densities in two different categories within the survey. The dependent variables (price, quality, and crowding) were measured using an online questionnaire that consisted of semantic differentials and a seven-point scale. Other than two reverse coded items (discussed later), all items in the price, quality, and crowding constructs were coded with one representing “low” and seven representing “high.” The price, quality, and crowding constructs consisted of three, eight, and five items, respectively. In order to ascertain that the questions posed by this study test perceived quality and perceived price in the same ways as previous studies, the questionnaire consisted of established scales taken from the *Marketing Scales Handbook: Volume IV*. The entire questionnaire is shown in Appendix B. The questions for price were adapted for this study from Jain and Srivastava (2000, pp. 351-362) and Yoo, Donthu, and Lee (2000, pp. 195-211). The
scales used for quality were adapted from a study by Buchanan, Simmons, and Bickart (1999, pp. 345-355), and the measures for crowding were tailored from Bateson and Hui (1987, pp. 85-90). The use of these established scales helps enhance the comparability of the current study to other past and future studies on the same topic to make the research more meaningful.

In addition, demographic questions (from the Qualtrics library) were added to determine if any other connections could be found. To prevent any responses that were primed by recognition of the retail stores pictured, respondents were asked if they recognized the space, and, if so, to type the name in a provided box. These responses were then culled from the data before analysis.

**Chapter 4: Results**

The six surveys resulted in a total of 146 responses over a period of 10 days. Survey results were exported to SPSS statistical software for analysis. Labels for both density and category were included for each set of data before the results were combined into a single database. The breakdown of responses by category and density is presented in Table 4 below.

Next, the data was cleaned, and incomplete data was eliminated. Some respondents completed the questionnaire more than once, so the data was filtered by respondent and time and only the first response was used. Lastly, all respondents that recognized the retail space were removed as well. These were removed because their familiarity with the retailer gave them a preconceived notion of the price and quality of the merchandise in the photo, and prevented them from objectively judging from the
photographs. After the data was cleaned, 103 valid responses remained. The breakdown of the cleaned data by density is presented in Table 4 below.

<table>
<thead>
<tr>
<th></th>
<th>Raw Data</th>
<th>Cleaned Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>High density</td>
<td>50</td>
<td>35</td>
</tr>
<tr>
<td>Medium density</td>
<td>53</td>
<td>36</td>
</tr>
<tr>
<td>Low density</td>
<td>43</td>
<td>32</td>
</tr>
</tbody>
</table>

The survey contained two reverse coded items to help determine the quality of the results: item 3 (exceptional merchandise/ordinary merchandise) from the quality construct and item 3 (much higher than average/much lower than average) for the price construct. These variables were recoded in SPSS so that they were directionally aligned with the other items.

Analysis and Interpretation

All analysis was conducted using IBM SPSS statistical software. First, a reliability analysis was run to determine whether the scales were internally consistent. The reliabilities of the quality, price, and crowding constructs are listed in Table 5 below.

<table>
<thead>
<tr>
<th>Construct</th>
<th>Cronbach’s Alpha</th>
<th>Number of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality</td>
<td>0.828</td>
<td>8</td>
</tr>
<tr>
<td>Price</td>
<td>0.758</td>
<td>3</td>
</tr>
<tr>
<td>Crowding</td>
<td>0.923</td>
<td>5</td>
</tr>
</tbody>
</table>

While all of the Cronbach’s alpha values are greater than the 0.7 standard for acceptable reliability, a “scale if item deleted” check revealed that the reliabilities could be significantly improved if item 3 was removed from the quality construct and item 1 was removed from the crowding construct. The resulting Cronbach’s alpha values are outlined in Table 6 below.
The resulting Cronbach’s alpha values show that the reliabilities of these established scales are very high. The remaining items for each construct were combined into a single summary measure for each construct. The means and standard deviations of these constructs by density are presented in Table 7 below.

### Table 7: Means and Variance for Quality, Price, and Crowding by Density

<table>
<thead>
<tr>
<th>Construct</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Density</td>
<td>33</td>
<td>4.6234</td>
<td>1.01193</td>
</tr>
<tr>
<td>Medium Density</td>
<td>37</td>
<td>4.6486</td>
<td>1.14810</td>
</tr>
<tr>
<td>High Density</td>
<td>37</td>
<td>4.9923</td>
<td>.94338</td>
</tr>
<tr>
<td>Total</td>
<td>107</td>
<td>4.7597</td>
<td>1.04308</td>
</tr>
<tr>
<td>Price</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Density</td>
<td>33</td>
<td>4.3636</td>
<td>1.08770</td>
</tr>
<tr>
<td>Medium Density</td>
<td>37</td>
<td>4.5586</td>
<td>1.00325</td>
</tr>
<tr>
<td>High Density</td>
<td>36</td>
<td>4.5370</td>
<td>1.20917</td>
</tr>
<tr>
<td>Total</td>
<td>106</td>
<td>4.4906</td>
<td>1.09565</td>
</tr>
<tr>
<td>Crowding</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Density</td>
<td>33</td>
<td>2.9621</td>
<td>1.41023</td>
</tr>
<tr>
<td>Medium Density</td>
<td>37</td>
<td>3.9189</td>
<td>1.58339</td>
</tr>
<tr>
<td>High Density</td>
<td>36</td>
<td>3.5903</td>
<td>1.38635</td>
</tr>
<tr>
<td>Total</td>
<td>106</td>
<td>3.5094</td>
<td>1.50393</td>
</tr>
</tbody>
</table>

To ensure that the respondent’s perception of density was similar to that of the researcher, a manipulation check was included in the survey. Respondents were asked to rate the product density in the photo from very low density (1) to very high density (7). The results are displayed in Table 8 below. As the results show, the means indicate that respondent perception and the researcher’s perception are aligned. Means for low, medium, and high density were 3.30, 4.11, and 4.53, respectively. Post-hoc analysis using
Tukey’s test indicates that there is a significant difference between the low-density and medium-density categories (p=0.049) and the low-density and high-density categories (p=0.001), but not between the medium-density and high-density categories (because the other p-values were greater than the significance level of 0.05). This is shown in Table 9.

Table 8: Means Table for Manipulation Check by Density Category

<table>
<thead>
<tr>
<th>Density of Survey Photo</th>
<th>Mean</th>
<th>N</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Density</td>
<td>3.30</td>
<td>33</td>
<td>1.425</td>
</tr>
<tr>
<td>Medium Density</td>
<td>4.11</td>
<td>36</td>
<td>1.563</td>
</tr>
<tr>
<td>High Density</td>
<td>4.53</td>
<td>36</td>
<td>1.207</td>
</tr>
<tr>
<td>Total</td>
<td>4.00</td>
<td>105</td>
<td>1.481</td>
</tr>
</tbody>
</table>

Table 9: Tukey’s Test Post-Hoc Analysis by Density

<table>
<thead>
<tr>
<th>(I) Density of Survey Photo</th>
<th>(J) Density of Survey Photo</th>
<th>Mean Difference (I-J)</th>
<th>Std. Error</th>
<th>Sig.</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Medium</td>
<td>-.808†</td>
<td>.339</td>
<td>.049</td>
<td>-1.61 - .00</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>-1.225†</td>
<td>.339</td>
<td>.001</td>
<td>-2.03 - -.42</td>
</tr>
<tr>
<td>Medium</td>
<td>Low</td>
<td>.808†</td>
<td>.339</td>
<td>.049</td>
<td>.00 - 1.61</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>-.417</td>
<td>.331</td>
<td>.422</td>
<td>-1.20 - .37</td>
</tr>
<tr>
<td>High</td>
<td>Low</td>
<td>1.225†</td>
<td>.339</td>
<td>.001</td>
<td>.42 - 2.03</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>.417</td>
<td>.331</td>
<td>.422</td>
<td>-.37 - 1.20</td>
</tr>
</tbody>
</table>

* †. The mean difference is significant at the 0.05 level.

Hypotheses Testing

An analysis of variance (ANOVA) was used to determine whether product density affected perceptions of quality, price, and crowding. First, a Levene’s test was run to determine whether the variances were equal. As Table 10 shows, the p-values for quality, price, and crowding were 0.288, 0.891, and 0.365, respectively. All of these are
greater than the significance level of 0.05, so the null hypothesis of equal variances cannot be rejected and the variances are assumed equal.

<table>
<thead>
<tr>
<th>Table 10: Levene’s Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Levene Statistic</td>
</tr>
<tr>
<td>Quality</td>
</tr>
<tr>
<td>Price</td>
</tr>
<tr>
<td>Crowding</td>
</tr>
</tbody>
</table>

The F-values of quality, price, and crowding for the ANOVA were determined to be 1.423, 0.321, and 3.801, respectively. The p-values were found to be 0.246, 0.726, and 0.026.

<table>
<thead>
<tr>
<th>Table 11: Analysis of Variance (ANOVA) in Quality, Price, and Crowding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sum of Squares</td>
</tr>
<tr>
<td>Quality Between Groups</td>
</tr>
<tr>
<td>Within Groups</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td>Between Groups</td>
</tr>
<tr>
<td>Price Between Groups</td>
</tr>
<tr>
<td>Within Groups</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

As shown in Table 11, product density was found to have a significant impact on crowding (F=3.801, p=.026). As Table 8 indicates, the low, medium, and high densities had means of 2.9621, 3.9189, and 3.5903, respectively. This means that the overall trend of increasing density resulting in increasing perceptions of spatial crowding is supported, but the “medium” category confounded the result. Therefore, Hypothesis one is partially supported: higher levels of product density do result in increased perceptions of spatial
crowding.

As shown in Table 10, the effect of product density on perceptions of quality and price are not significant. Therefore, Hypotheses two and three are not supported. There is no statistically significant difference in perceived product quality or price based on product density. In fact, the means (Table 8) indicate the opposite trend—consumer perception of quality and price appear to be positively affected by increased density.

### Table 12: Tukey’s Test Post-Hoc Analysis

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>(I) Density of Survey Photo</th>
<th>(J) Density of Survey Photo</th>
<th>Mean Diff. (I-J)</th>
<th>Std. Error</th>
<th>Sig.</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low</td>
<td>Medium</td>
<td>-.02527</td>
<td>.24876</td>
<td>.994</td>
<td>-.6168 - .5662</td>
</tr>
<tr>
<td>Quality</td>
<td>High</td>
<td>Medium</td>
<td>-.36890</td>
<td>.24876</td>
<td>.303</td>
<td>-.9604 - .2226</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>High</td>
<td>.02527</td>
<td>.24876</td>
<td>.994</td>
<td>-.5662 - .6168</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>Medium</td>
<td>-.34363</td>
<td>.24155</td>
<td>.333</td>
<td>-.9180 - .2307</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>High</td>
<td>.36890</td>
<td>.24876</td>
<td>.303</td>
<td>-.2226 - .9604</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>High</td>
<td>.34363</td>
<td>.24155</td>
<td>.333</td>
<td>-.2307 - .9180</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>Medium</td>
<td>.02527</td>
<td>.24155</td>
<td>.333</td>
<td>-.6168 - .5662</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>Low</td>
<td>.36890</td>
<td>.24155</td>
<td>.333</td>
<td>-.2226 - .9604</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>Low</td>
<td>.34363</td>
<td>.24155</td>
<td>.333</td>
<td>-.2307 - .9180</td>
</tr>
<tr>
<td>Price</td>
<td>Low</td>
<td>Medium</td>
<td>-.19492</td>
<td>.26405</td>
<td>.741</td>
<td>-.8229 - .4330</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>Medium</td>
<td>-.17340</td>
<td>.26577</td>
<td>.791</td>
<td>-.8054 - .4586</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>High</td>
<td>.19492</td>
<td>.26405</td>
<td>.741</td>
<td>-.4330 - .8229</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>Medium</td>
<td>.02152</td>
<td>.25817</td>
<td>.996</td>
<td>-.5924 - .6335</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>High</td>
<td>.17340</td>
<td>.26577</td>
<td>.791</td>
<td>-.4586 - .8054</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>High</td>
<td>-.02152</td>
<td>.25817</td>
<td>.996</td>
<td>-.6355 - .5924</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>Medium</td>
<td>-.95680</td>
<td>.35086</td>
<td>.020</td>
<td>-1.7912 - -.1224</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>Medium</td>
<td>-.62816</td>
<td>.35315</td>
<td>.182</td>
<td>-1.4680 - .2117</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>High</td>
<td>.95680</td>
<td>.35086</td>
<td>.020</td>
<td>.1224 - 1.7912</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>High</td>
<td>.02864</td>
<td>.24304</td>
<td>.605</td>
<td>-.4871 - 1.1444</td>
</tr>
<tr>
<td>Crowding</td>
<td>High</td>
<td>Medium</td>
<td>.62816</td>
<td>.25315</td>
<td>.182</td>
<td>-.2117 - 1.4680</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>Medium</td>
<td>-.2864</td>
<td>.24304</td>
<td>.605</td>
<td>-.4871 - 1.1444</td>
</tr>
</tbody>
</table>

*. The mean difference is significant at the 0.05 level.
Post-hoc analysis was conducted using Tukey’s test. The results, shown in Table 12, indicate that the only statistically significant difference that exists occurs between low and medium difference within the crowding scale. In other words, there is only a statistically significant increase in crowding perceptions from low density to medium density.

**Chapter 5: Discussion**

Although results do show that product density has a positive impact on perceptions of crowding, the results regarding perceptions of quality and price were surprising. It appears that consumers’ perceptions of price and quality may actually increase when product density increases. This is counter to much research, which suggests that as density increases, the perception of crowding has a negative impact on other consumer outcomes. There are several reasons why these unexpected results may have occurred.

First, although diversity in the merchandise (different types of clothing for the clothing category and different bottle colors and types for the housewares category) was used to make the photo look more realistic, this could have inadvertently affected the perception of density. A series of studies by Redden and Hoch (2009) determined “that having variety reduced perceived quantity from 5% to 12%” (p.415). So perhaps product variety confounded the results of this study; although there were more items, because there was also more variety, the perceptions of quantity did not increase as intended. Also, a study by Bertini, Wathieu, and Iyengar (2012) found that having a large assortment of different levels of quality positively impacted both consumers’ appreciation for quality and the price they were willing to pay for a high quality product (Bertini,
Wathieu, and Iyengar, 2012, pp. 43-47). Because of the variation in the products shown in the photographs, respondents could have believed the products were of different levels of quality and therefore increased their perceived price of those items.

Second, product density is defined as the “amount of merchandise and fixtures” in a limited space (Machleit, Eroglu, and Mantel, 2000, p. 30). It was not possible to manipulate the fixtures in the retail stores used for this study, so only the merchandise was manipulated. As a result, only part of density was manipulated. Since it was hypothesized that crowding mediated the relationship between product density and perceived price and quality, this could have affected the price and quality perceptions.

Third, there is also the possibility of a sampling error. The relationship between density and crowding has already been supported by a previous study (Machleit, Eroglu, and Mantel, 2000, p. 30). From the lack of significant relationships among the variables and especially the lack of a significant relationship between the medium and high densities for crowding, the quality of the data could be questionable. This could be a result of the sample used, so a larger, more representative sample would possibly unearth significant differences in the variables studied.

**Chapter 6: Limitations and Future Research**

This study used pictures instead of physical retail spaces. The use of pictures relied on respondents’ abilities to imagine themselves in the photographed retail space. It is difficult to manipulate three-dimensional density within a photograph in a way that can affect respondents’ perceptions of spatial crowding because it is an affective response to surroundings. Since photographs are not able to convey all the surroundings, it is difficult for respondents to perceive crowding. Also, the sample consisted of students who were
majoring in marketing or fashion merchandising. Since they may have been familiar with the effects of product density, this could have skewed the results as well. This study should be repeated using a mall-intercept strategy in which different density retail spaces are set up sans pricing or branding and consumers are introduced to the spaces and asked questions similar to those in this study. Also, only two product categories were used because of the small scope of this study, so future studies could include more categories to increase generalizability.

Finally, the manipulation check results were questionable; therefore, the results must be interpreted with caution. Future studies could include a sample that is more representative of the population to obtain more accurate results.
Appendix A: Survey Photos

Low Density Clothing

Medium Density Clothing

High Density Clothing
Appendix B: Copy of Study Survey

Dear Participant:
I am a marketing student at USM that is conducting research for my undergraduate thesis. The purpose of this survey is to explore customers' perceptions of price and quality. The data collected will be used purely for research purposes. This survey will involve a picture of a retail space and proceeding questions. It should take a maximum of 15 minutes to complete. Your identity and information provided will be kept confidential and anonymous. Clicking on the button below will indicate your consent to participate in this research. Participation is completely voluntary and may be discontinued at any time without penalty. Thank you for taking the time to give your honest opinion.
Sincerely,
Joshua Holston

If you have any concerns or questions, please contact me at joshua.holston@eagles.usm.edu

This project has been reviewed by the Human Subjects Protection Review Committee, which ensures that research projects involving human subjects follow federal regulations. Any questions or concerns about rights as a research subject should be directed to the chair of the Institutional Review Board, The University of Southern Mississippi, 118 College Drive #5147, Hattiesburg, MS 39406-0001, (601) 266-6820.

[Single photo from one category of a single density]

**DIRECTIONS: Please indicate your opinion of the above picture by selecting a response to the following statements.**

The items in the above picture appear to be:

- Inferior Products
- Superior Products
- Worse that average products
- Better than average products
- Exceptional merchandise
- Ordinary merchandise
- Poor quality
- Excellent quality

The items in the above picture appear to have:

- Flimsy construction
- Durable construction
- Very little attention to details
- A lot of attention to details

The items in the above picture appear to be constructed from:

- Poor materials
- Very good materials

The items in the above picture:

- Won't last a long time
- Will last a long time
DIRECTIONS: Please indicate your opinion of the above picture by selecting a response to the following statements.

My overall expectations about the prices at the store in the above picture are:
   Not at all expensive | Very expensive

I expect the prices at the store in the above picture to be:
   Low | High

Compared to other stores of this type, the prices at the store in the above picture are most likely to be:
   Much higher than average | Much lower than average

This store would likely make me feel:
   Not Stuffy | Stuffy
   Not Crowded | Crowded
   Not Cramped | Cramped
   Like I have freedom to move | Like my movement is restricted
   Spacious | Confined

Product density is defined as the amount of merchandise within a limited space. High density spaces have a lot of merchandise, while low density spaces have little merchandise.

Given this information, the density of the retail space pictured above is:
   Very Low Density | Very High Density

Did you recognize the retail space pictured above?
   ○ Yes   ○ No

What is the name of the retailer in the picture above?
   ___________________________________ (text box that allowed respondent input)

What year were you born?
   [drop down box with years 1900 – 2000]

What is your gender?
   ○ Male   ○ Female
What is your ethnicity?
White ☐ Caucasian ☐ African American ☐ Hispanic ☐ Asian ☐ Native American ☐ Pacific Islander ☐ Other ☐

What is your estimated yearly household income?
[Students – use your parent’s household]
[drop-down box that includes the following choices: $0 - $25,000; $25,001 - $50,000; $50,001 - $75,000; $75,001 - $100,000; $100,001 - $125,000; $125,001 - $150,000; Over $150,000]

What is the highest level of education you have completed?
☐□ Less than High School
☐□ High School / GED
☐□ Some College
☐□ 2-year College Degree
☐□ 4-year College Degree
☐□ Masters Degree
☐□ Doctoral Degree
☐ Professional Degree (JD, MD)

Are you a student?
☐□ Yes
☐ No

Are you completing this survey for class credit?
☐ Yes
☐ No

For which professor’s class are you completing this survey?
[drop down box with four choices]

Please type your name in the text box below to receive credit.
_____________________________________ (text box that allows respondent input)

Please click the ">>" button below to submit your response. Thank you for your participation. It is greatly appreciated!

*The clothing shown in this study is available at CLICK Boutique on Front Street in Hattiesburg, and the housewares shown are available at MeLinda’s Fine Gifts in Picayune, Mississippi.*
Appendix C: IRB Approval

THE UNIVERSITY OF
SOUTHERN MISSISSIPPI

* * * * * * * * * * * 

To the IRB Office via the 'Adverse Event Report Form'.
References


November 18, 2012, from the EBSCOhost database.


