Article

Position Effects of Menu Item Displays in Consumer Choices: Comparisons of Horizontal Versus Vertical Displays

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Jungkeun Kim[1], Euejung Hwang[2], Jooyoung Park[3], Jacob C. Lee[4], and Jongwon Park[5]

Abstract

Consumers typically make choices based on a menu that lists a variety of food items. Prior research has shown that the position of food items within a menu (center vs. edge) can impact choices (e.g., edge preference and edge aversion). This research extends the literature by demonstrating that the display format of a menu (horizontal vs. vertical displays) can determine the relative impact of these influences. Two experiments find that the middle options are preferred when food options are displayed horizontally (vs. vertically), whereas the edge items are preferred under a vertical display (vs. a horizontal display). These differences extend to different types of foods (food vs. beverage), and to even and odd numbers of options (e.g., four vs. five). These findings increase the understanding of how food item displays can influence consumer choices, and provide important implications for practitioners and policymakers, including how to effectively position food items.

Keywords

restaurant menu, horizontal versus vertical displays, edge advantage, edge aversion

Introduction

When designing a menu, a restaurant manager must make a number of decisions, including what food items to offer and how to price them. One potentially crucial but often overlooked decision to make is how to position or arrange the various items within the menu. For example, where should we place the signature dish or the most profitable dish? Prior research has identified the diverse nature of "position effects" on consumer choices, including edge preference (i.e., items listed first and/or at the end are relatively more preferred) and edge aversion (i.e., items listed in the middle are preferred). However, less is known about how the overall display format of arranging food items on menus (horizontal vs. vertical displays) influences choices. In particular, whether and how the display format can moderate position effects are not well understood. The present research intends to provide insights into this matter.

Extant research has documented varied types of position effects, such as edge preference and edge avoidance. However, studies that found different results also vary from one another in terms of the stimulus categories (e.g., foods vs. beverages), the number of food items on menus (e.g., even vs. odd numbers of items), and the display formats (horizontal vs. vertical). Therefore, it is unclear as to which of these differences is responsible for a particular type of position effect to predominate. To overcome this ambiguity, at least partially, we manipulated both the position of items and the display format of items simultaneously within a single experiment. To provide a clear and reliable empirical evidence, we conducted multiple experiments (Lynn, 2017). Results from two experiments consistently showed that the relative impact of position effects (edge preference and edge aversion) depended on the horizontal versus vertical display formats. Moreover, this dependency was replicated across different types of foods (food and beverages), and across even and odd numbers of items on the menus.

Theoretical Background and Hypothesis Development

Position Effects

Position effects can be broadly categorized into edge advantage and edge aversion (or centrality preference; Bar-Hillel,

[1]Auckland University of Technology, New Zealand
[2]University of Otago, New Zealand
[3]Peking University HSBC Business School, China
[4]Ulsan National Institute of Science and Technology (UNIST), Republic of Korea
[5]Korea University, Republic of Korea

Corresponding Author:
Jacob C. Lee, Assistant Professor, School of Business Administration, Ulsan National Institute of Science and Technology (UNIST), 50, UNIST-gil, Ulsan 44919, Republic of Korea.
Email: lee.jacob.c@gmail.com

2015). First, edge advantage refers to the tendency to choose the first or last option in the display. This effect has been found in a variety of domains, including foods (e.g., Dayan & Bar-Hillel, 2011; Rozin et al., 2011), commercial products (e.g., Nisbett & Wilson, 1977), hotel booking (Ert & Fleischer, 2016), and political voting (Koppell & Steen, 2004). For example, Dayan and Bar-Hillel (2011) showed that a food item is more likely to be chosen when it is placed either at the beginning or end of a menu list, regardless of the type of food (e.g., appetizers, soft drinks, or desserts) or the number of items listed (e.g., four, six, eight, or 10 items). Rozin and colleagues (2011) found that food items placed on the edge of a three-row food display are chosen more frequently than those placed in the middle. A similar edge advantage appears for nonfood items, such as stockings and nightgowns (Nisbett & Wilson, 1977) and hotels in online booking sites (Ert & Fleischer, 2016).

By contrast, edge aversion refers to the tendency to avoid options placed at the top or bottom of a menu, thereby favoring the item located in the middle. Edge aversion has also been demonstrated for both nonfood (e.g., Christenfeld, 1995; Rodway, Schepman, & Lambert, 2012; Shaw, Bergen, Brown, & Gallagher, 2000) and food items (e.g., Carroll & Vallen, 2014; Pinger, Ruhmer-Krell, & Schumacher, 2016). For example, Pinger and colleagues (2016) showed that menu items in the middle, compared with those on the edge, were selected 5% more frequently in real choices at a local restaurant. Similar effects have been found in nonfood choices, such as choosing one of three chairs on which to sit (Shaw et al., 2000), and choosing one stall from a public restroom (Christenfeld, 1995).

In short, prior research has documented two primary position effects: edge preference and edge avoidance. Yet, it is difficult to determine when a particular effect is likely to predominate because the different patterns of results in previous studies were cofounded with different stimuli and procedures across studies, as noted earlier. Thus, the different pattern of results might have resulted due to differences in the type of choice stimuli, the number of choice options, the display format, or due to some combinations of these differences. For example, an edge advantage appears to be more prevalent for food menu choices in which decision makers are required to process each option, whereas an edge aversion might be more pronounced for identical option choices, such as a public bathroom stall in which decision makers are not required to process each option in detail (Bar-Hillel, 2015). However, different studies used various numbers of options in the choice set, ranging from a small number of options (e.g., Carroll & Vallen, 2014; Keller, Markert, & Bucher, 2015; Nisbett & Wilson, 1977) to a large number of options, such as 10 (e.g., Dayan & Bar-Hillel, 2011; Ert & Fleischer, 2016), or to a very large number of options (17 options; Rodway et al., 2012). Finally, some studies displayed choice options horizontally (e.g., Keller et al., 2015; Shaw et al., 2000), while others presented choice options vertically (Dayan & Bar-Hillel, 2011; Ert & Fleischer, 2016; Rozin et al., 2011), while the type of choice stimuli and the number of choice options covaried.

Regarding the different horizontal versus vertical display formats, the outcomes of choice have been mixed. On one hand, in the horizontal display format, Keller and colleagues (2015) found an edge aversion effect, that is, a healthy snack (e.g., apple) was preferred more when it was placed in the middle (vs. on the edge) of the list (also see, Shaw et al., 2000), whereas Rozin and colleagues (2011) found an edge advantage in a salad bar menu choice. On the other hand, in the vertical display format, Dayan and Bar-Hillel (2011) found an edge advantage in their study of a real restaurant setting. Ert and Fleischer (2016) similarly discovered an edge advantage in online hotel booking in the vertical format. These inconsistent results make it difficult to identify which of these procedural differences led to the variation in the position effects observed. As previous researchers employed only one display format at a time and did not simultaneously compare two display formats, it is worth investigating the display format as an important determinant of the position effect.

Thus, as an attempt to better understand the conditions under which the edge preference versus edge avoidance effect is likely to predominate, the present research simultaneously considered some of the aforementioned procedural differences (e.g., display format, number of items on the menu, etc.). In doing so, we focused on the display format as a key moderator for two reasons. First, horizontal and vertical displays are the two fundamental ways of arranging food items on a menu. In fact, in the real world, both formats are commonly used in the design of menus. Thus, it is practically important to understand the impact of menu display formation on choices. Second, prior research on horizontal versus vertical displays seems to suggest reasons as to why the display format can moderate position effects, as will be explained in the next section.

Processing Differences Under Horizontal Versus Vertical Display Formats

Extant research shows that display formats (i.e., horizontal vs. vertical) can significantly affect information processing and judgmental heuristics. First, different display formats can impose different levels of processing difficulty. For example, Williams's (1966) findings suggest that people process numeric information more quickly when it is aligned horizontally rather than vertically. More recently, Deng, Kahn, Unnava, and Lee (2016) suggested that people can process a horizontal (vs. vertical) display more easily, thereby increasing the number of options searched and enhancing variety-seeking behavior. This variation may be due to a difference in the dominant order of reading and

writing, and thus can be contingent upon cultural background with different orientations of reading and writing. For example, horizontal (vs. vertical) English menus are processed more easily for Westerners, whereas the opposite is true for vertical (vs. horizontal) menus in Chinese (Dong & Salvendy, 1999).

Second, a particular position in the display of items can have an analogical meaning. For example, research has shown that vertical positions are associated with a top–bottom analogy, such as "the higher, the better" (e.g., Meier & Robinson, 2004; Schubert, 2005; Valenzuela, Raghubir, & Mitakakis, 2013). For example, Meier and Robinson (2004) showed that people recognized positive words faster when they are placed at the top (vs. bottom) of a screen, and the opposite was found for negative words. This finding implies that the perceptual simulation of space involved in making judgments equates "good" as "up" and "bad" as "down" (Schubert, 2005). In addition, Valenzuela and colleagues (2013) demonstrated several lay beliefs that consumers hold regarding shelf displays, such as the tendency for expensive items to be placed on the top (vs. bottom) rows on shelves. However, under a horizontal display, people tend to have the naïve belief that the best options are typically placed in the middle (Valenzuela & Raghubir, 2009).

Moderating Impact of Display Format on Edge Avoidance Versus Edge Preference

In general, when multiple-choice options are simultaneously presented, the one that receives particular attention is more likely to be considered and chosen, independently of the specific characteristics of the options (e.g., Johnson & Raab, 2003). However, the option that receives particular attention might differ, depending on whether the option is displayed horizontally or vertically. As discussed earlier, people tend to process items more easily under a horizontal format than under a vertical format; additionally, the vertical position of items (within a vertical format) can receive the special metaphorical meaning of "higher is better." Thus, under a vertical display, people cannot easily process all of the items (e.g., Deng et al., 2016); options that are placed in the middle are unlikely to receive much attention, relative to those items at the beginning or end. To this extent, options placed on the edge are more likely to be preferred. In addition, if the metaphorical meaning associated with verticality (i.e., "the higher, the better") is activated, the one at the top would mostly likely be preferred.

On the contrary, under a horizontal display, people can easily process all of the items on the menu (Deng et al., 2016). In this case, the options that can naturally attract relatively greater amounts of attention may be preferred, independently of the options' characteristics. Atalay, Bodur, and Rasolofoarison (2012) found that options placed in the middle (vs. on the edge) of a horizontal display are likely to receive more attention. Specifically, using eye-tracking methodology, these researchers showed that people tended to have a central gaze tendency, which suggests higher visual attention to the middle options. In addition, people sometimes have the naïve belief that the best options are typically placed in the middle (Valenzuela & Raghubir, 2009). Therefore, the central position of a menu item within a horizontal display format can function as an effective attention-getting cue, as well as a heuristic cue based on laypeople's beliefs. Therefore, individuals are more likely to prefer the middle option(s), exhibiting edge avoidance.

Hypothesis 1: Preference for nonedge options (i.e., edge avoidance) would be higher under a horizontal (vs. vertical) display, whereas preference for edge options (i.e., edge preference) would be higher under a vertical (vs. horizontal) display.

Two experiments tested our hypothesis by displaying choice options horizontally versus vertically. In addition, Study 1 used an even number of choice options (four different tacos or four different wines) as the choice stimuli, whereas Study 2 used an odd number of options (five different cocktails). The hypothesis was consistently confirmed, regardless of the stimulus category (foods vs. beverages) or the number of options (even vs. odd), as will be seen below.

Study 1

Design and Methods

A total of 202 U.S. residents (average age = 32.7, *SD* = 7.4, 48.0% female), recruited from an online panel (i.e., Amazon Mechanical Turk), participated in return for $.50 USD. Participants were assigned to one of eight conditions of a 2 (display format: horizontal vs. vertical) × 4 (order counterbalancing: four different orders of items) between-subjects design.

All participants performed two choice tasks (the taco choice and wine choice), within a short interval. Participants were first given the taco choice task in which they were asked to imagine that they visited a new Mexican restaurant, and that they were to select one out of four different tacos. Each taco was identified by its name (e.g., "Trailer Park") and detailed content description. The four items were displayed either horizontally or vertically (see Figure 1). In addition, within each display format, the order of items was varied in four different orders across participants for counterbalancing (e.g., [taco 1, 2, 3, and 4] vs. [taco 2, 3, 4, and 1] vs. [taco 3, 4, 1, and 2] vs. [taco 4, 1, 2, and 3]). Thus, the total times each item appeared in a particular position in the display were the same for all four items.

After the taco choice task and a short delay, participants were given the second wine choice task in which they were

Figure 1.

Examples of Stimuli used in Study 1: Tacos.

Note. (a) Taco choice: Vertical display (i.e., 1, 2, 3, and 4 order); (b) Taco choice: Horizontal display (i.e., 3, 4, 1, and 2 order).

first asked to imagine going shopping for a bottle of wine and then to select one out of the four different wines. Each wine option was described by its name, year, and characteristics, with a picture of the wine. The display format and the order counterbalancing were varied similarly to that of the taco choice task (see Figure 2).

Results

Participants' choice was categorized as edge preference if they chose the first or last item in the display, and as edge avoidance otherwise. Then, we first examined whether the order counterbalancing factor affected choices. The results of a bi-logistic analysis indicated that the order counterbalancing did not influence the choices, nor did it interact with the display format, both in the taco choice task (both $p > .10$) or the wine choice task (both $p > .10$). Therefore, we collapsed the data across the counterbalancing factor in further analyses.

We hypothesized that edge avoidance would be greater when the options are displayed horizontally versus vertically. This expectation was confirmed in the χ^2 analyses of choice as a function of the display format. First, with respect to the taco choices, preference for the nonedge options was greater under a horizontal display versus a vertical display, both in taco choices—60.4% (=58 / 96) versus 46.2% (=49 / 106), $\chi^2(1) = 4.07$, $p < .05$—and in the wine choices—68.1% (=62 / 91) versus 44.1% (=49 / 111), $\chi^2(1) = 11.62$, $p < .001$.

As a supplementary analysis, we analyzed participants' choice of the first item in the display as a function of the display format. The results indicated that the likelihood of

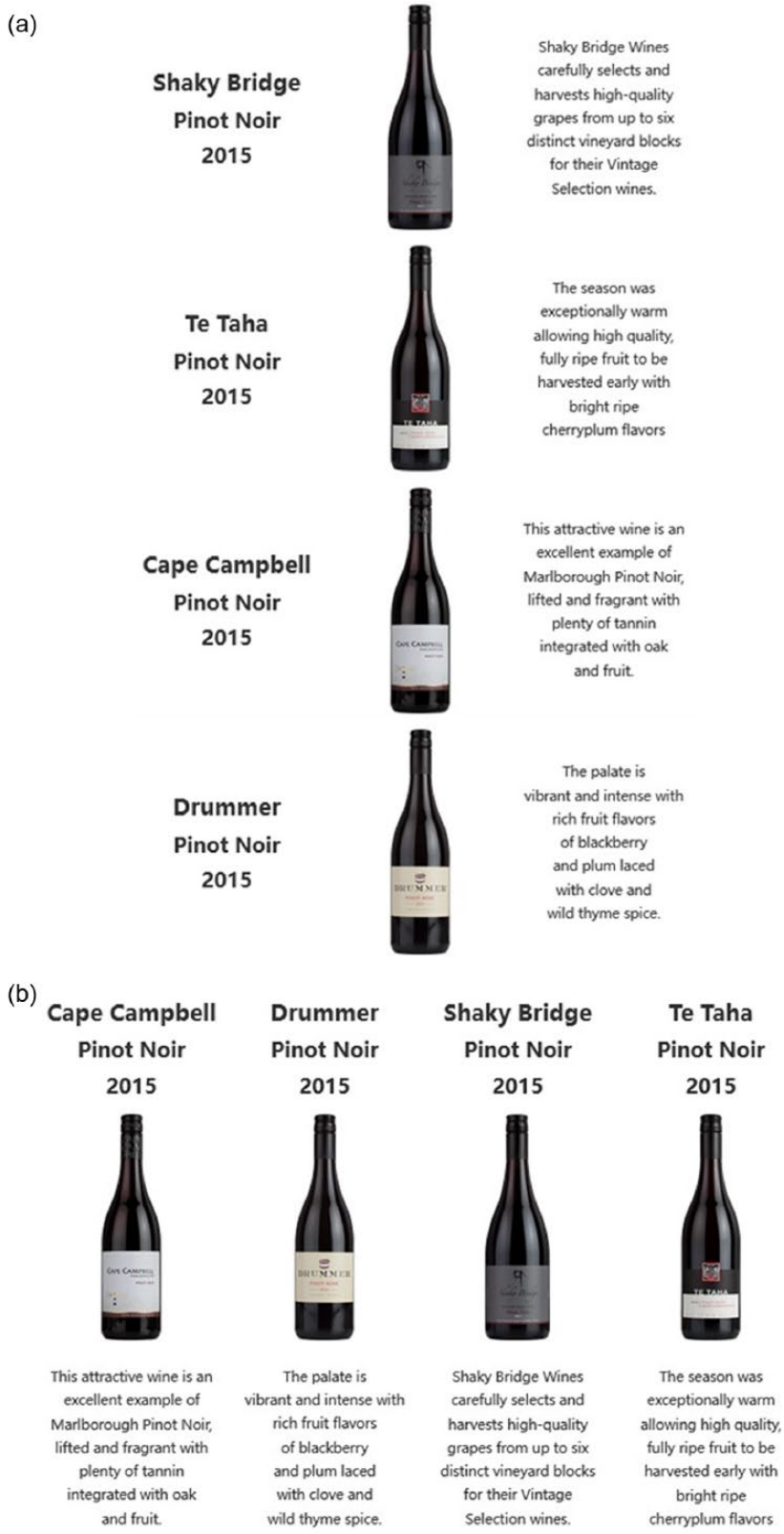

Figure 2.

Examples of Stimuli used in Study 1: Wine.

Note. (a) Wine choice: Vertical display (i.e., 1, 2, 3, and 4 order); (b) Wine choice: Horizontal display (i.e., 3, 4, 1, and 2 order).

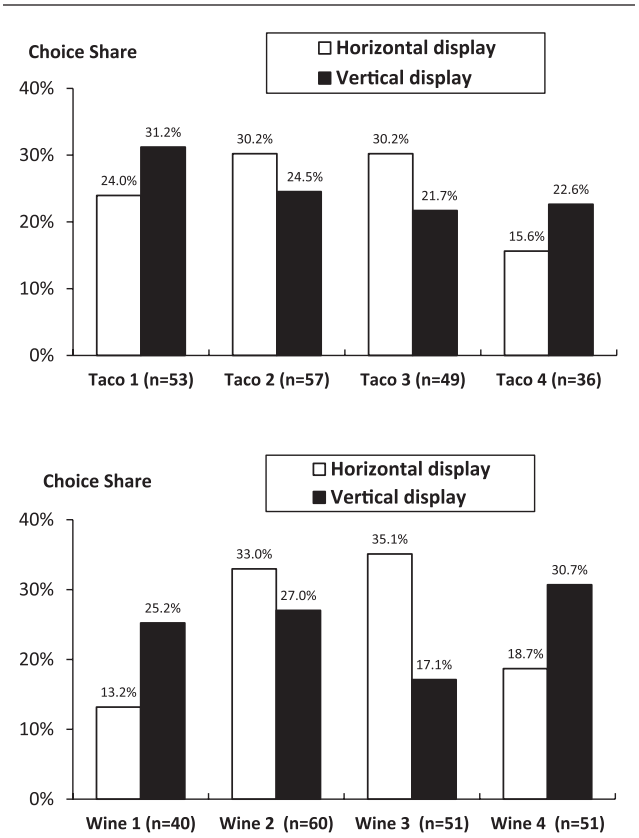

Figure 3.
Results of Study 1.

choosing the first item was the same across horizontal versus vertical display conditions in the taco choices—24.0% (=23 / 96) versus 31.1% (=33 / 106), $\chi^2(1) = 1.29$, $p > .10$—but was significantly different across the conditions in the wine choices—25.2% (=28 / 111) versus 13.2% (=12 / 91), $\chi^2(1) = 4.56$, $p < .05$. This discrepancy implies that the greater propensity for edge preference under the vertical (vs. horizontal) display could not be explained solely by propensity for the first option. The choice shares for both the taco and wine categories can be found in Figure 3.

Study 2

Study 1 confirmed our expectation that edge avoidance (edge preference) would be more (less) pronounced under a horizontal display than under a vertical display. In addition, the effect was replicated across different stimuli (tacos and wine). However, only an even number of choice options (i.e., four options) was used, where there was no true centrally positioned option. The current study extended the results of Study 1 by using an odd number of choice options (i.e., five options) and by employing a different stimulus category (cocktails).

Design and Methods

A total of 155 U.S. residents (average age = 36.2, *SD* = 11.8, 49.0% female), recruited from an online panel (i.e., Amazon Mechanical Turk), participated in this study in return for $.50 USD. Participants were assigned to one of 2 (type of display: horizontal vs. vertical) × 2 (order counterbalancing: two different orders) conditions in a between-subjects design.

Participants were first asked to imagine that they were drinking a cocktail in a bar and were asked to select one out of five different cocktails. Each cocktail was identified by its name and brief content information. The five options were displayed either horizontally or vertically (see Figure 4). Within each display format, the order of the options was counterbalanced across participants. Specifically, about half of the participants were shown the options in one randomly determined order (i.e., "ABCDE" order, see Figure 4a), while the other half was shown the options in the reversed order (i.e., "EDCBA" order, see Figure 4b).

Results

We recoded and analyzed the choice data, as we did in Study 1. That is, participants' choice was categorized as edge preference if they chose the edge item (i.e., the first or last option), and as edge avoidance otherwise. A preliminary analysis of these data indicated that the order counterbalancing did not affect the choice ($b = .45$, $SE = .34$, Wald = 1.71, $p > .10$), nor did it interact with the display format ($b = –.28$, $SE = .68$, Wald = .16, $p > .10$). Therefore, we collapsed the data across the two display format conditions for further analyses.

A χ^2 regression analysis of the data (as a function of the display format) indicated that, consistent with our prediction, participants' edge avoidance (i.e., preference for the nonedge options in the display) was greater when the options were displayed horizontally versus vertically, 70.9% (=56 / 79) versus 55.3% (=42 / 76), $\chi^2(1) = 4.07$, $p < .05$.

As a supplementary analysis, we examined the impact of the display format on participants' choice of the center option (i.e., the third item in the display). The result indicated that participants' choice of the center option did not differ under the horizontal versus vertical display, 26.6% (=21 / 79) versus 25.0% (=19 / 76); $\chi^2(1) = .05$, $p > .10$. Therefore, greater preference for edge avoidance under the horizontal display could not be attributable to greater preference for the true center option alone. In addition, we examined the impact of the display format on preference for the first option in the display, as we did in Study 1. In this case, however, participants' choice of the first option was greater under the vertical display versus horizontal display, 28.9% (=22 / 76) versus 10.1% (=8 / 79), $\chi^2(1) = 8.79$, $p < .01$. This

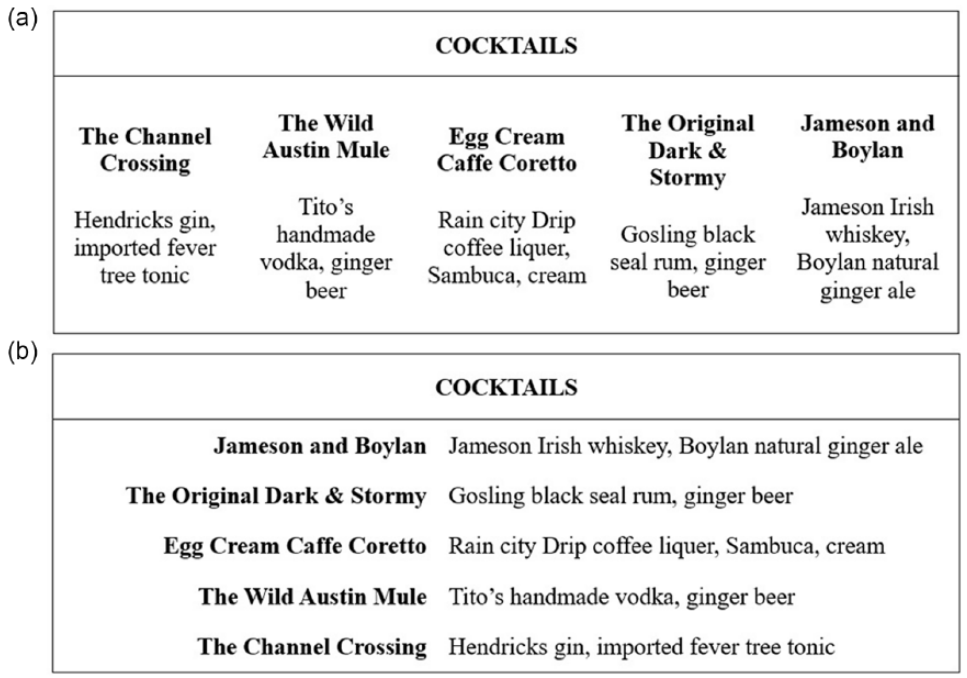

Figure 4.

Examples of Stimuli used in Study 2.

Note. (a) Horizontal display with order 1 (i.e., ABCDE order); (b) Vertical display with order 2 (i.e., EDCBA order).

finding suggests that the greater edge preference under the vertical display may be in part attributable to the greater preference for the first option as a similar pattern from the wine case in Study 1. The significant result of the first option preference is, however, different from the inconsistent results (i.e., a significant first option effect for tacos, but not for wine) we observed in Study 1. We will address this discrepancy in the "Discussion" section. A detailed pattern of choice results is shown in Figure 5.

Discussion

The aim of the current study was to investigate the impact that a display (i.e., vertical vs. horizontal) has on preferences for menu items. Two studies provided empirical evidence that preference for the middle option(s) was higher when the menu items were displayed in a horizontal (vs. vertical) format across different types of food (e.g., tacos, wine, or cocktails), and even versus odd numbers of items on the menu (e.g., four or five).

The findings from the present research have several important theoretical and managerial implications. First, prior research has demonstrated the two primary types of position effects—edge preference (i.e., preference for the options listed first and last) and edge avoidance (i.e., preference for nonedge items)—yet, what determines the direction of the impact is not well understood. The present research contributes to the literature by identifying the format of displaying the choice options (horizontal vs. vertical display) as an important determinant of edge preference versus edge avoidance. Two experimental studies consistently show that consumers' preference for nonedge items (i.e., edge avoidance) is greater when the menu items are displayed horizontally than vertically. These findings have not previously been reported elsewhere.

Second, we could eliminate two alternative explanations for our findings. First, the greater edge avoidance found under the horizontal (vs. vertical) display may conceivably have been driven by greater preference for the true center option in the display. However, this possibility was disconfirmed in the supplementary analysis in Study 2. Second, an edge advantage found in the vertical (vs. horizontal) format could have been driven by insufficient information about the food items on the menu, or by an attempt to minimize the cognitive/physical effort associated with making a choice (e.g., Bar-Hillel, 2015). To test these alternative explanations, we analyzed the duration of the time spent on the decision-making across the two display format conditions. The results indicated no significant differences (all *p*s>.28) across all three decisions made in Studies 1 and 2, thus excluding one of the alternative explanations. Finally, the greater edge avoidance under the horizontal display

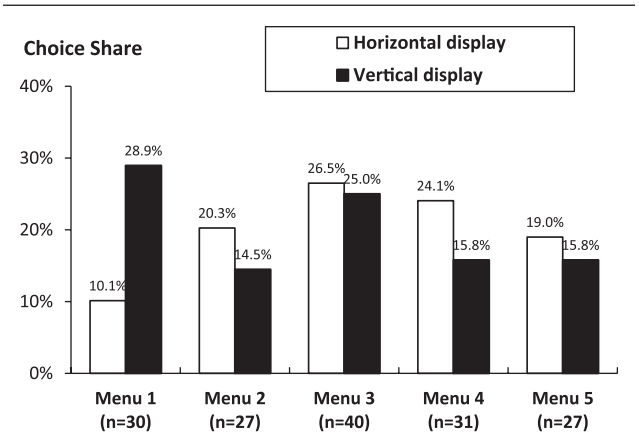

Figure 5.
Results of Study 2.

might have been driven by greater preference for the first option alone (not preference for the two edge items) under the vertical display. However, this possibility did not receive consistent support in our studies (i.e., the possibility was disconfirmed in the two choice tasks of Study 1, but was supported in Study 2).

Third, our results have a straightforward implication for managers. That is, instead of randomly placing items anywhere on a menu, simply manipulating their position within the menu can lead to changes in the relative share of sales with respect to the different menu items. For example, restaurants managers can better promote a specific dish, such as the one that is most profitable, by putting it in the middle of the display if the menu items are displayed horizontally, and on the edge of the display if the items are displayed vertically. Furthermore, our findings suggest nudging as a way to increase healthy food consumption (Dayan & Bar-Hillel, 2011; Wilson, Buckley, Buckley, & Bogomolova, 2016). By "priming" nudges (Wilson et al., 2016), using the location and display formats, we may be able to influence people to choose healthier options.

Nevertheless, our research has several limitations. First, our research used a scenario-based approach in examining the impact of the display format on food choice. Thus, it is desirable to replicate the results of real choices in future research. Second, the different preferences across the vertical versus horizontal display formats are related to preference for the first option. We found higher preference for the first option in the vertical (vs. horizontal) display condition for tacos and cocktails, but not for wine. Preference for the first option could be influenced by various factors (e.g., knowledge level or familiarity of target products) other than the display format. Future study needs to investigate the impact of these factors on preference for the first option, as well as the edge options. Finally, although our hypothesis is derived from the implications of various findings in the literature (i.e., central gaze tendency, the middle option as the best option heuristic, or the higher-is-better inference) and results support the hypothesis, we did not measure the mediating processes to confirm the underlying mechanism. Future research examining the issue in real choice settings and empirically assessing the underlying processes is of great theoretical and empirical importance. In addition, future study needs to investigate which of the different explanations proposed is more influential in menu item choice for different display formats in various situations. For example, we should investigate additional factors (e.g., cultural characteristics regarding the direction of reading or individual cognitive capacity) that may moderate consumer choice preference.

Authors' Note

All authors contributed equally.

Declaration of Conflicting Interests

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Author Biographies

Jungkeun Kim is a Senior Lecturer in the Department of Marketing, Auckland University of Technology. His main research interests are in consumer decision-making and consumer behavior. He currently serves as an Associate Editor of the *Australasian Marketing Journal*.

Euejung Hwang is a Lecturer in the Department of Marketing at the University of Otago. Her research interests are in sensory marketing and food choice and behavior.

Jooyoung Park is an Assistant Professor in the Peking University HSBC Business School. Her research interests focus on consumer information processing, consumer motivation and self-regulation, embodied cognition, and brand management.

Jacob C. Lee is an assistant professor in the School of Business Administration, Ulsan National Institute of Science and Technology (UNIST). His research focuses on display marketing, consumer happiness, and CEO marketing.

Jongwon Park is a Professor in Korea University Business School, Korea University. His research interests focus on the effects of informational, contextual, and individual factors on consumer judgments and choices.