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From quality to quantity: The role of common features in consumer preference

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ABSTRACT

Although previous studies of consumer choice have found that common features of alternatives are cancelled and that choices are based only on unique features, a recent study has suggested that common features are canceled only when they are irrelevant in regard to all unique features. The present study hypothesized that the role of a common feature in consumer choice depends on its quantity as well as its quality. Experiments 1 and 2 tested this hypothesis and the equate-to-differentiate account by varying the quality and the quantity of common features. Experiment 3 examined the cognitive process that was proposed to serve as the mechanism for the common feature effect using eye-tracking methodology. This study provided further insight into conditions when the cancellation-and-focus model applies. Study results revealed an attribute-based tradeoff process underlying multiple-attribute decision making, and suggested an avenue through which marketers might influence consumer choices.

1. Introduction

Would you prefer a small chicken filet with a large iced Coke or a large chicken filet with a small iced Coke? Once you have made your decision, would you change your mind if you were then offered a free towelette with either choice?

1.1. Empirical evidence for the cancellation-and-focus model

The above choice situation commonly occurs in everyday life. Typically, options provide not only unique features, such as differing quantities of sandwiches and sodas, but also shared features, such as the towelette. Many previous studies of forced choice assumed that features common to all of the alternatives in a choice set are canceled during the choice process (Tversky, 1972) and that because common features are subjectively canceled; choices are based only on unique features. This conceptualization forms the basis of decision axioms and decision models (Sherman, Houston, & Eddy, 1999). Inspired by Tversky's (1977) feature-matching model, Houston et al. proposed a feature-matching model for preference judgments, the cancellation-and-focus model (Houston & Sherman, 1995; Houston, Sherman, & Baker, 1989, 1991). This model, which

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treats common and unique features differently, consists of a two-component comparison process in which common features of the alternatives are cancelled and unique features serve as the starting point for the comparison.

Considerable evidence exists to support the cancellation-and-focus model. To test this model, Houston et al. (1989) constructed option pairs in which the pair either shared bad features and differed in good features (unique good pairs) or shared good features and differed in bad features (unique bad pairs); they found that the second choice tended to be preferred for unique good pairs but rejected for unique bad pairs. Houston et al. claimed that these results indicated that common features are canceled, leaving only good features for unique good pairs and bad features for unique bad pairs. Because sequential presentation focuses on the second option, this option was more attractive for unique good pairs and less attractive for unique bad pairs (Houston & Sherman, 1995; Houston et al., 1989, 1991). Many later studies have replicated Houston et al.'s findings (Hodges, 1997, 1998; Hodges, Bruininks, & Ivy, 2002; Mantel & Kardes, 1999; Sanbonmatsu, Kardes, & Gibson, 1991; Slaughter & Highhouse, 2003; Strathman, Boninger, & Baker, 1992; Wang & Wyer, 2002). The cancellation-and-focus model has also been found to be robust for actual conditions, such as choosing between political candidates (Houston & Roskos-Ewoldsen, 1998) and consumer goods (Dhar & Sherman, 1996). More recently, Sütterlin, Brunner, and Opwis (2008) used eye-tracking methodology to provide further evidence for the model. They found that common features received fewer fixations than unique features, indicating that common features are not taken into account during decision-making.

In regard to the opening question of whether an individual would change his or her choice if a free towelette were added to each option, Li, Zheng, and Li (2007) demonstrated that individuals' decisions were not affected by the offer of a free towelette. This finding, which was predicted by the cancellation-and-focus model, satisfies the cancellation principle (Tversky & Kahneman, 1986). However, Li et al. (2007) also found that when a free iced black tea was added to both alternatives instead of the free towelette, people tended to choose the small Coke and large chicken filet option. This finding violates the cancellation principle and presents an issue worth further investigation.

1.2. Decision strategies in consumer choice

Decision strategies in consumer choice can be categorized as alternative-based processing and attribute-based processing according to the direction of the comparison between candidate alternatives. Alternative-based processing is based on an alternative-by-alternative comparison. Available alternatives are independently assigned overall values that are then compared, and the option with the highest value is chosen (Scholten & Read, 2010). In contrast, attribute-based processing is based on an attribute-by-attribute comparison. Consumers first compare options with reference to a single attribute and then compare another attribute (Bettman, 1979; Payne, 1976).

Traditional theories of consumer choice, such as the weighted additive model (Tversky, 1972) and Dawes rule (Dawes, 1979), are based on the concept of utility maximization. These models assume that people integrate information in an alternative-based manner, that is, they weigh and add all the available attributes to obtain an overall value for each option and then choose the option with the highest value (Dieckmann, Dippold, & Dietrich, 2009).

However, the traditional view has been widely challenged. Tversky (1969) suggested that attribute-based strategies are simpler and more natural than alternative-based strategies. Considering the limited processing capacity of human decision makers, different attribute-based decision strategies have been proposed to describe or predict consumer choices, such as the lexicographic rule (Tversky, 1969), the take-the-best strategy (Gigerenzer & Goldstein, 1996), the majority of confirming dimensions strategy (Russo & Dosher, 1983), and the elimination-by-aspect strategy (Tversky, 1972). In a recent study, Li (2004) suggested that human decision-making is ruled by an equate-to-differentiate approach. This approach models much of human choice behavior as a process in which people seek to equate less significant differences between alternatives and leave the greater one-dimensional difference as basis for determining the final choice. Extensive literature has documented these attribute-based strategies to be at least as effective as the more complex alternative-based strategies in predicting consumer choices (Czerlinski, Gigerenzer, & Goldstein, 1999; Gigerenzer, Czerlinski, & Martignon, 1999).

1.3. Relevant vs. irrelevant: the quality of common features

A common feature is categorized as "relevant" or "irrelevant" based on its relationship with the unique features. A common feature is relevant if it adds to a dimension that is already considered in the choice. The relevant common feature is jointly valued with the unique feature in that dimension because they can both meet a certain aspect of people's demand. For example, the free iced black tea option for both food choices is a relevant common feature because it adds to the drink dimension included in the choice between the small chicken filet with a large iced Coke and the large chicken filet with a small iced Coke. The iced black tea is jointly valued with the iced Coke in the drink dimension because they can both quench people's thirsts. In contrast, a common feature is irrelevant if it adds a new dimension. The irrelevant common feature is valued separately from all the unique features. The towelette is an irrelevant common feature in the food problem because it adds a new personal care dimension to the food and drink dimensions already considered in the choice, and it is separately valued from either the Coke or the sandwiches.

In the equate-to-differentiate approach, Li et al. (2007) suggested that when a relevant common feature is added to both alternatives, the more "different" dimension is directed toward other dimensions that are not relevant to the added relevant common feature, which encourages choice reversal. In contrast, an irrelevant common feature does not affect either a one-dimensional difference or the final choice.

Take the food problem as an example. When the participants were asked to choose between a small chicken filet with a large iced Coke and a large chicken filet with a small iced Coke. The two options on the food dimension were paired as "a small chicken filet" and "a large chicken filet", whereas the two options on the drink dimension were paired as "a large Coke" and "a small Coke". Based on the equate-to-differentiate approach, individuals who regarded the "small Coke" and "large Coke" pair as the dimension that exhibited a greater difference would choose the preferred drink option. However, when the relevant common feature of a free iced black tea was provided, the two drink possibilities became "a large Coke plus an iced black tea" and "a small Coke plus an iced black tea", which were "more nearly equivalent". Adding the relevant common feature diminishes the differences in the drink dimension and makes the differences in the food dimension appear to be greater, leading to a choice reversal. However, because adding the irrelevant common feature of a towelette to both options does not change the perception of which dimension exhibited greater differences, individuals' choices remain unchanged.

1.4. From quality to quantity: a theoretical analysis

To obtain a detailed understanding of the effects of common features on consumer preferences, we performed a theoretical analysis based on the equate-to-differentiate approach (Li, 2004). For a binary choice between options A and B, the unique features of each option can be exclusively classified under n dimensions as follows: $A = (a_1, a_2, \ldots, a_n)$, $B = (b_1, b_2, \ldots, b_n)$. We assume that A has an advantage over B along dimension 1, and B has an advantage over A along dimension 2. We further assume that the difference between options in dimension 2 is greater than that in other dimensions apart from dimension 1:

$$v(a_1) - v(b_1) > v(b_2) - v(a_2) > |v(a_i) - v(b_i)| \quad (i = 3, \ldots, n). \tag{1}$$

The value function $v(\cdot)$ is taken from the prospect theory (Kahneman & Tversky, 1979). According to the equate-to-differentiate approach, individuals use the difference between options in dimension 1, which exhibits the greatest difference, to determine the final choice. As A dominates B in dimension 1, individuals prefer option A.

We first consider the situation in which the irrelevant feature c is added to both options. As c is classified under a newly created dimension that is orthogonal to the existing n dimensions in the decision space, c and the unique features are valued separately as $v(c)$, $v(a_i)$, and $v(b_i)$.Therefore, no influence is exerted on the difference in each existing dimension, and no difference exists between the options in the newly created dimension:

$$v(a_1) - v(b_1) > |v(a_i) - v(b_i)| > v(c) - v(c) = 0 \quad (i = 2, \ldots, n). \tag{2}$$

Individuals continue to make choices based on the differences in dimension 1. Therefore, the decisions of individuals do not change.

We then consider the situation in which the relevant feature c is added to both options, and assume that c is exclusively classified under dimension 1. Therefore, c and a_1, and c and b_1 are valued jointly as $v(a_1 + c)$ and $v(b_1 + c)$, respectively. The value function v is concave, thus exhibiting diminishing absolute sensitivity (Scholten & Read, 2010; Tversky & Kahneman, 1991); the marginal impact of an outcome decreases with its quantity. An equal increase in the quantity of dimension 1 is inevitably associated with a decrease in the difference between options in dimension 1. A critical value c_0 must exist such that the advantage of dimension 1 equals that of dimension 2 when the common feature is considered:

$$v(a_1) - v(b_1) > v(a_1 + c_0) - v(b_1 + c_0) = v(b_2) - v(a_2). \tag{3}$$

The equate-to-differentiate approach suggests that the choice reversal results from the change in the dimension with the greatest difference. Therefore, determining whether adding a relevant common feature will lead to a change in the dimension with the greatest difference requires us to consider the quantity of common features as well. Only when the quantity of the common feature is above the critical value can the dimension, perceived as more "different," shift from dimension 1 to dimension 2:

$$v(b_2) - v(a_2) > \max(v(a_1 + c) - v(b_1 + c),\ |v(a_i) - v(b_i)|) \quad (i = 3, \ldots, n) \text{ iff } c > c_0. \tag{4}$$

Therefore, people will turn to prefer option B, which is better in terms of dimension 2.

This analysis reveals that common features influence the preferential choice when two conditions are met. First, with regard to the feature quality, the common feature must be relevant to the unique features. Adding a relevant common feature triggers a reevaluation of the intra-dimensional difference. This *reevaluation process* is necessary but not sufficient to influence the preferential choice. Second, with regard to the feature quantity, the quantity of the relevant common feature must exceed the critical value. Only when this condition is met can the individual perception of which dimension is more "different", which determines the final choice, change. This *change process* is necessary and sufficient for the common feature effect under the equate-to-differentiate approach. If either of these two processes does not occur, then the common features will not influence preferential choice.

1.5. From theoretical analysis to empirical test

The above theoretical analysis leads to two hypotheses: (1) adding a relevant common feature will influence preferential choice only when the quantity of the common feature exceeds the critical value; and (2) adding an irrelevant common feature will not influence preferential choice whether or not the quantity of the common feature exceeds the critical value.

The theoretical analysis provided a potential mechanism for the influence of common features on preferential choice and a theoretical basis for empirically testing these hypotheses. Three experiments were designed to test the hypotheses. Experiment 1 tested the two proposed hypotheses by varying both the quality and the quantity of the common features. Experiment 2 was primarily designed to determine whether the equate-to-differentiate account provided a reasonable explanation for the observed phenomenon of choice reversal. Experiment 3 used eye-tracking methodology to further test the two-component process proposed by the theoretical analysis.

2. Experiment 1

Li et al. (2007) claimed that individuals consistently indicate a preference and cancel out common features only if these features are irrelevant. However, based on the theoretical analysis above, we hypothesized that the relevant common features would also have no effect on preferential choice if the quantity of common features falls below the critical value. This experiment was designed to test the hypotheses by varying the quantity of both relevant and irrelevant common features.

2.1. Methods

2.1.1. Participants

The initial participant pool consisted of 64 undergraduate students (including 31 women) from Peking University. All participants provided oral consent and completed a questionnaire with a series of binary choices regarding fast-food meals and phone plans. Each participant received a token gift in return for their participation.

2.1.2. Materials and procedure

To ensure that study results would be directly comparable to the findings reported in previous studies, we adopted and extended the one good scenario (the *fast-food problem*) employed in Li et al. (2007; Experiment 3). We also developed a parallel scenario (the *phone-cost problem*) to determine whether the common feature effect also occurred in service scenarios. Seven binary options were developed for each problem (see Tables 1 and 2). Alternatives without common features were first presented to participants; the other six options (each with a single common feature) were then presented in randomized order. Participants were randomly assigned to one of two different versions of the questionnaire that counterbalanced the order of the problem presentation.

Participants were instructed to rate their preference for each binary option on a 6-point scale ranging from 1 (definitely choose option A) to 6 (definitely choose option B). Each participant thus performed a total of 14 ratings.

2.2. Results and discussion

The mean preference rating as a function of the common feature is presented in Fig. 1 (panel A: the fast-food problem; panel B: the phone-cost problem). A one-way repeated measures ANOVA was performed, followed by LSD pairwise comparison tests. The analysis revealed a significant effect of common features on preference rating for both the fast-food problem ($F(6,378) = 60.32$, $p < .001$, $\eta^2 = .49$) and the phone-cost problem ($F(6,378) = 109.59$, $p < .001$, $\eta^2 = .64$).

Further analyses revealed that in the fast-food problem, participants were more likely to choose option A (a better drink) when "10 pcs chicken wings" was added to both alternatives ($p < .001$), but were more likely to choose option B (better food) when "a large iced Sprite" was included ($p < .001$). There was no significant impact on preference rating when "1 pc chicken wings" ($p = .18$), "a sample of iced Sprite" ($p = .32$), "a large towelette" ($p = .10$) or "a small towelette" ($p = .15$) were added to both alternatives.

Similar results were obtained for the phone-cost problem. Participants were more likely to choose option B (lower message rates) when the package also allowed subscribers to select 10 phone numbers that could be called at discounted rates ($p < .001$) but were more willing to choose option A (lower call rates) when the package allowed subscribers to select 10 phone numbers to which messages could be sent at discounted rates ($p < .001$). There was no significant impact on

Table 1
The binary options in the fast-food problem.

Option A		Option B
A small chicken filet		A large chicken filet
A large iced Coke		A small iced Coke
	10 pcs chicken wings (relevant, great)	
	1 pc chicken wings (relevant, small)	
	A large iced Sprite (relevant, great)	
	A sample of iced Sprite (relevant, small)	
	A large towelette (irrelevant, great)	
	A small towelette (irrelevant, small)	

Note: The common feature classifications (quality, quantity) contained in the parentheses in Tables 1 and 2 did not appear in questionnaires.

Table 2
The binary options in phone-cost problem.

Option A	Option B
50 cents/voice minute	30 cents/voice minute
8 cents/text message	15 cents/text message
10 self-selected phone numbers with discounted call rates: 15 cents/voice minute (relevant, great)	
1 self-selected phone number with a discounted call rate: 15 cents/voice minute (relevant, small)	
10 self-selected phone numbers with discounted message rates: 6 cents/text message (relevant, great)	
1 self-selected phone number with a discounted message rate: 6 cents/text message (relevant, small)	
10 free ring tone downloads (irrelevant, great)	
1 free ring tone download (irrelevant, small)	

preference ratings when participants could designate 1 phone number that they could call at a discounted rate ($p = .29$), 1 phone number to which they could send messages at a discounted rate ($p = .80$), receive "10 free ring tone downloads" ($p = .63$) or receive "1 free ring tone download" ($p = .71$).

In the present experiment, participants' choices remained consistent when the feature added to both alternatives was irrelevant regardless of its quantity, which was consistent with the results obtained in Li et al. (2007). In addition, the present study extended earlier findings regarding relevant common features. In the present study, not all relevant common features affected option choice—adding a relevant common feature influenced preferential choice only when a greater quantity was supplied.

3. Experiment 2

The results of Experiment 1 supported the study hypotheses and indicated that whether or not adding a common feature influenced preferential choice depended on its quantity as well as its quality. However, the experiment did not identify the mechanism influencing preferential choice. Although we hypothesized that this effect was due to a *change process* that altered individuals' perception of the dimension with the greater perceived difference between options, no empirical evidence to support this hypothesis was provided.

The goal of Experiment 2 was twofold. First, we explored the mechanism underlying the role of common features in consumer choice by drawing on the equate-to-differentiate approach to determine whether the extents to which the differences on a single dimension were taken into consideration were able to predict individuals' preferences. Second, we examined whether the pattern of results found in the undergraduate sample would be replicated in a more representative sample of consumers.

3.1. Methods

3.1.1. Participants

A randomly selected sample of 82 fast-food consumers who ate at a fast food restaurant at least twice a week ($M = 3.83$) and 89 mobile phone users with average mobile fees per month that exceeded RMB 30 yuan ($M = 48.26$ yuan) in the cities of Beijing and Wuhan in China voluntarily participated in the study. The sample as a whole included 81 women, and participants ranged in age from 19 to 28 years.

3.1.2. Materials and procedure

To ensure that the series of experiments in this study were directly comparable to the findings in Experiment 1, the fast-food problem and the phone-cost problem were also used in Experiment 2. Fast-food consumers were presented with seven fast-food choice pairs, and mobile phone users were presented with seven phone-cost choice pairs.

The procedures in Experiment 2 were identical to those in Experiment 1. In addition, a variant of the verbal report methodology of *aspect listing* (Johnson, Häubl, & Keinan, 2007) was employed to identify the aspects of the situation that participants considered during the decision-making process. After rating their preferences, participants were instructed to write down their reasons for choosing either option A or option B.

3.2. Results and discussion

3.2.1. Preference rating and aspects order

The preference ratings for the fast-food and phone-cost problems were similar to those found in Experiment 1 (see Fig. 2). A one-way repeated measures ANOVA revealed a significant main effect of common features on preference ratings for both fast-food meals ($F(6,486) = 37.34$, $p < .001$, $\eta^2 = .32$) and phone plans ($F(6,528) = 137.08$, $p < .001$, $\eta^2 = .61$).

Table 3 presents a taxonomy of the aspects potentially considered in decision making as well as the typical aspects listed by participants (Johnson et al., 2007), and the four types of aspects were grouped into two categories. The sequential nature of our model predicted that the type of aspect generated would change during the course of aspect listing (Johnson et al., 2007). For instance, in the fast-food problem, participants who thought that the food dimension was more "different" and

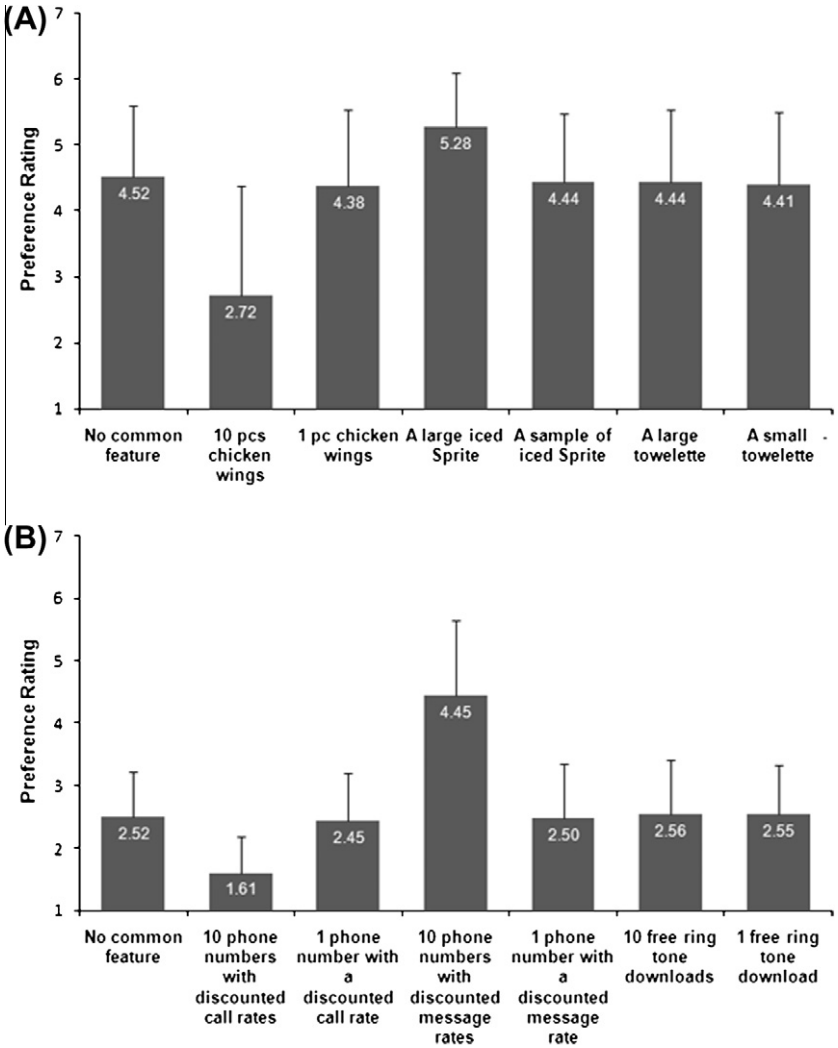

Fig. 1. Mean preference ratings for the fast-food problem (panel A) and the phone-cost problem (panel B), which ranged from 1 (definitely choose option A) to 6 (definitely choose option B).

used this difference to determine their final choice should initially produce lists that identified more food-related aspects that focused on the negative properties of option A or positive properties of option B (presented in the top left and bottom right panels of Table 3, respectively), and drink-related aspects that focused on the positive properties of option A or negative properties of option B (presented in the top right and bottom left panels of Table 3, respectively) should be produced more frequently toward the end of the list. Participants who thought that the drink dimension was more "different" and based their decision-making on this perceived difference should exhibit the opposite pattern.

Because the number of aspects that participants listed differed, the dimension that participants perceived to be "more different" was calculated based on scores that reflected participants' tendency to mention the aspects associated with a particular dimension. This score, the standardized median rank difference of aspect type (SMRD), was defined as:

$$\mathrm{SMRD} = 2 \times (\mathrm{MR}_1 - \mathrm{MR}_2)/\mathrm{n} \tag{6}$$

where MR_i denotes the median rank of the listed aspects for dimension i, n denotes the total number of aspects listed. The SMRD score took on values ranging from -1 (all dimension 2 aspects were listed before dimension 1 aspects) to 1 (all dimension 1 aspects were listed before dimension 2 aspects). Dimension 1 was defined as the food dimension in the fast-food problem and as the call rate dimension in the phone-cost problem.

A one-way repeated measures ANOVA revealed a significant main effect of common features on SMRD score for both the fast-food problem ($F(6,486) = 15.75$, $p < .001$, $\eta^2 = .16$) and the phone-cost problem ($F(6,528) = 19.20$, $p < .001$, $\eta^2 = .38$). LSD pairwise comparison tests indicated that, as expected, the drink dimension was perceived as "more different" when "10 pcs chicken wings" was added to both alternatives ($p = .01$) in the fast-food problem. Participants were more likely to base decision making on differences in the food dimension when "a large iced Sprite" was added ($p < .001$). There was no signif-

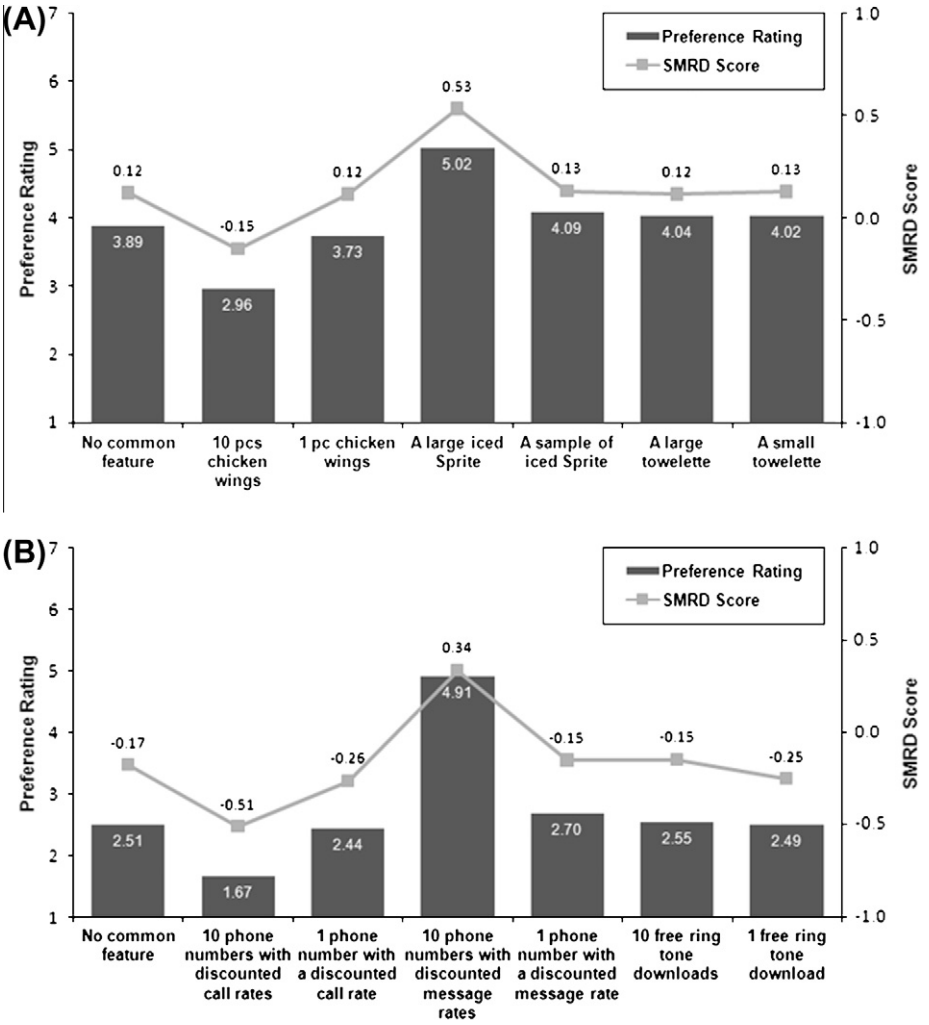

Fig. 2. Mean preference ratings, which ranged from 1 (definitely choose option A) to 6 (definitely choose option B), and SMRD scores for the fast-food problem (panel A) and the phone-cost problem (panel B). The increase in the SMRD score represented a shift in perception of greater difference from the food/call rate dimension to the drink/message rate dimension, while a decrease in the SMRD score exhibited a shift in the opposite direction.

Table 3
Classification of aspects based on focus and valence (with examples for the fast-food problem).

Aspect focus	Aspect valence	
	Negative	Positive
Option A	A small **sandwich**? I'm not full if I choose A	I'm thirsty. I want the bigger **Coke** in A
Option B	So hot today. The **drink** in B is not enough	There is a big **sandwich** in B

icant difference in the SMRD score when "1 pc chicken wings" ($p = .89$), "a sample of iced Sprite" ($p = .86$), "a large towelette" ($p = .88$) or "a small towelette" ($p = .88$) were added. Similar results were found for the phone-cost problem. Differences in message rates were perceived as greater and determined the final choices of most participants when they were allowed to select 10 phone numbers to call at a discounted rate ($p < .001$), whereas the difference in call rate played a decisive role when they were allowed to send discounted text messages to 10 phone numbers ($p < .001$). There was no significant effect on SMRD scores when any other common feature was added ($ps > .05$).

3.2.2. Mediation analysis

The purpose of the mediation analysis was to determine whether the effect of common features on preferential choice was mediated by the dimension that was perceived as more "different" and whether the equate-to-differentiate approach

could explain the mechanism producing the effect. The mediation analysis followed the procedures described by Judd, Kenny, and McClelland (2001) for within-subject designs. Having shown that the SMRD scores (the proposed mediator) and preference ratings (the dependent variable) were affected by the feature manipulations, we performed a separate regression analysis to predict the preference rating differences from the SMRD score sum and the SMRD score difference for each featured manipulation.

Table 4 reveals that the SMRD score difference significantly predicted the difference between the preference ratings for each feature manipulation, but the SMRD score sum did not. The model revealed that the differences between the SMRD scores mediated the common feature effect, but there was no evidence that the differences had a moderating effect because the sum of the SMRD scores was not a significant predictor in the model. To determine whether the mediation was partial or full (Judd et al., 2001), we centered the sum of SMRD in the regression model and tested the significance of the intercept. The intercept was significant for each feature manipulation (see Table 5), which indicated that the mediation was partial because some of unexplained variance still remained.

3.2.3. Discussion

The preference rating results for both the undergraduate and consumer samples revealed that a relevant common feature significantly affected preference ratings ONLY when relatively large quantities were involved. Irrelevant common features did not affect preference ratings, and cancellation occurred. The mediation analysis as well as with the full mediation effect found in Li et al.'s (2007) study, which used a between-subject design, provided empirical evidence that the extents to which the differences on a single dimension were taken into consideration predicted individuals' preferences.

4. Experiment 3

In the previous experiments, the effect of common features on preferential choice was robust for both the undergraduate and consumer samples. However, although questionnaire-based experiments can measure both intermediate and final decision outcomes, they do not identify the cognitive processes that occur prior to the responses. For instance, although different influences on rated preference can be identified, it is not possible to determine the extent to which attention to different common features varies. Further, although it is possible to detect a shift in the decisive dimension, it is not possible to determine whether a reevaluation process occurs prior to the change process as predicted by the proposed two-component process. To seek answers to these questions, we used eye-tracking methodology to explore the cognitive processes underlying decision outcomes and test the two-component process (for general reviews of eye tracking research, see Rayner, 1978, 1998, 2009).

4.1. Methods

4.1.1. Participants

Fifty-eight college students (28 women) with a mean age of 21.76 years participated in the experiment. All participants had normal or corrected-to-normal vision and provided oral consent prior to the experiment. Each participant received RMB 20 yuan (approximately $3) for their participation.

4.1.2. Materials and procedure

The participants' eye movements were monitored using an EyeLink II tracker (SR Research, Canada), with a sample rate of 250 Hz. The eye tracker automatically recorded the eye that provided the better performance in calibration. The stimuli were presented on a 19-inch CRT monitor controlled by a Dell PC with a display resolution of 1024 × 768 pixels. A chin-rest located 60 cm away from the monitor was used to minimize head movements. Viewed from this distance, the screen subtended a visual angle of 28° horizontally and 21° vertically. The participants responded by pressing a button on a Microsoft SideWinder gamepad.

Table 4
Regression of preference rating difference on the SMRD score sum (SS) and the SMRD score difference (SD).

Feature manipulation		b	SE	β	$t(80)$	R^2	Adjusted R^2
10 pcs chicken wings	SS	−0.22	0.19	−0.14	−1.13	0.08	0.05
	SD	−0.53*	0.21	−0.31	−2.53	0.37	0.35
A large iced Sprite	SS	−0.02	0.20	−0.01	−0.11	0.37	0.35
	SD	−1.47***	0.22	−0.61	−6.77	0.65	0.64
10 phone numbers with discounted call rates	SS	0.13	0.12	0.10	1.11	0.65	0.64
	SD	1.32***	0.14	0.87	9.75	0.47	0.46
10 phone numbers with discounted message rates	SS	0.003	0.10	0.002	0.03	0.47	0.46
	SD	1.08***	0.12	0.69	8.65		

Note: Significant level is indicated by
* $p < .05$.
*** $p < .001$.

Table 5
Coefficient of constant in regression of preference rating difference on the sum (centered) and the difference between the SMRD scores.

Feature manipulation	*b*	*SE*	*t*(80)	R^2	Adjusted R^2
10 pcs chicken wings	−0.78***	0.17	−4.57	0.08	0.05
A large iced Sprite	0.53**	0.17	3.11	0.37	0.35
10 phone numbers with discounted call rates	−0.39***	0.09	−4.45	0.65	0.64
10 phone numbers with discounted message rates	1.86***	0.13	14.59	0.47	0.46

Note: Significant level is indicated by
** $p < .01$
*** $p < .001$.

To avoid the effects of word length, only the fast-food problem in which all features including an equal number of Chinese characters was used. The original binary choice without common features was presented as a stimulus but was not included in the eye movement analyses because the number of features varied. To assess the strategies participants used to compare alternatives, the candidate alternatives were simultaneously presented with the unique features displayed above the common features.

Three practice trials that followed the same pattern but displayed different content were presented to familiarize the participants with the presentation mode. Participants were instructed to orally report each option's features and their choices to indicate that they fully understood the task. During the testing session, the pair of fast-food meals with no common features was initially displayed followed by the other six pairs in a randomized order. Each trial began with a central fixation cross that focused the participant's attention on the middle of the screen.

The eye movement data were analyzed using Eyelink Data Viewer software (SR Research, Canada). A saccade was defined as an eye movement with a velocity greater than 30 deg/s and an acceleration greater than 8000 deg/s^2. Fixations were defined as periods of relatively stable gaze between two saccades; however, 522 fixations that are shorter than 80 ms (approximately 4.3%) were excluded from the analyses. Six non-overlapping same-sized (376 × 184 pixels) rectangular regions of interest (ROI) were defined, including four regions covering the unique features (ROI_U) and two regions covering the common features (ROI_C).

4.2. Results and discussion

Overall, 15 of the 406 trials (approximately 3.7%) were excluded from analysis. Six trials were discarded because of eye tracking failure; three trials with a decision time shorter than 200 ms were considered to be anticipations; six trials with decision times greater than 3 standard deviations from the mean were also excluded from the analyses. The mean fixation duration was 203.93 ms and the standard deviation was 41.07 ms. Values for the empty cells were estimated based on the following formula: estimated value = condition mean + (subject mean − grand mean) (Hand, Miellet, O'Donnell, & Sereno, 2010). Following Slattery, Staub, and Rayner (2012), 1 degree of freedom for the repeated measurement ANOVA reported in this experiment was subtracted for every value estimated.

4.2.1. Choice

A chi-square test revealed a significant difference between the choices associated with the different feature manipulations ($\chi^2(6) = 17.88$, $p < .01$). Tests for differences in proportions also revealed a significant increase in the percentage of participants choosing option A (a larger Coke) when "10 pcs chicken wings" was added ($z = 2.83$, $p < .01$), and a significant

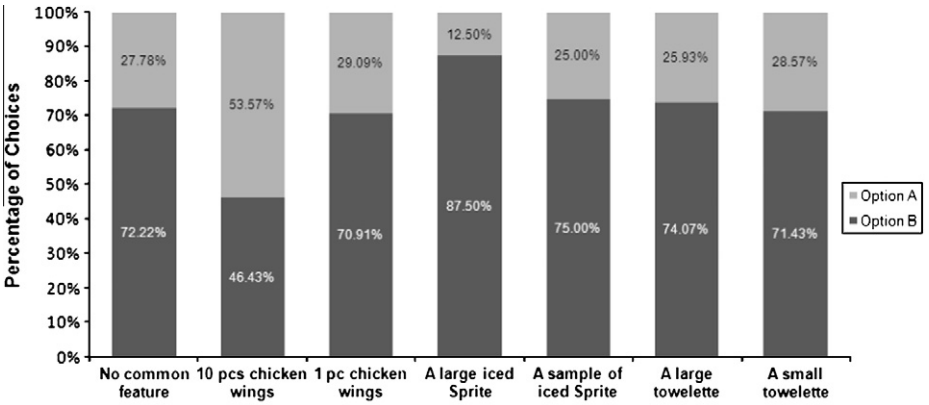

Fig. 3. The percentage of choices as a function of the common feature.

increase in the percentage of participants choosing option B (a larger burger) when "a large iced Sprite" was added ($z = 2.05$, $p = .02$). As Fig. 3 indicates, no significant differences in preferential choices were found when "1 pc chicken wings" ($z = 0.16$, $p = .44$), "a sample of iced Sprite" ($z = 0.34$, $p = .37$), "a large towelette" ($z = 0.22$, $p = .41$) or "a small towelette" ($z = .09$, $p = .46$) was added. The analysis indicated that adding a common feature influenced preferences not only in rating tasks but also in forced choice tasks.

4.2.2. Attention to common features

Attention to common features was analyzed using a one-way repeated measures ANOVA with common feature as the within-participants factor and number of fixations (i.e., the total number of fixations in the ROI), dwell time (i.e., the sum of the durations across all fixations in the current ROI) and the last fixation time (i.e., the onset time for the last fixation in the current ROI) as dependent variables. The amount of time spent gazing at a feature represented the attention focused on the feature. The more one feature attracted, the more time should be spent gazing at it. Similarly, the number of fixations represented attention toward the feature (Pomplun, Ritter, & Velichkovsky, 1996). In addition, we reason that the last fixation should appear later for the features that were more deeply taken into consideration in the decision-making process.

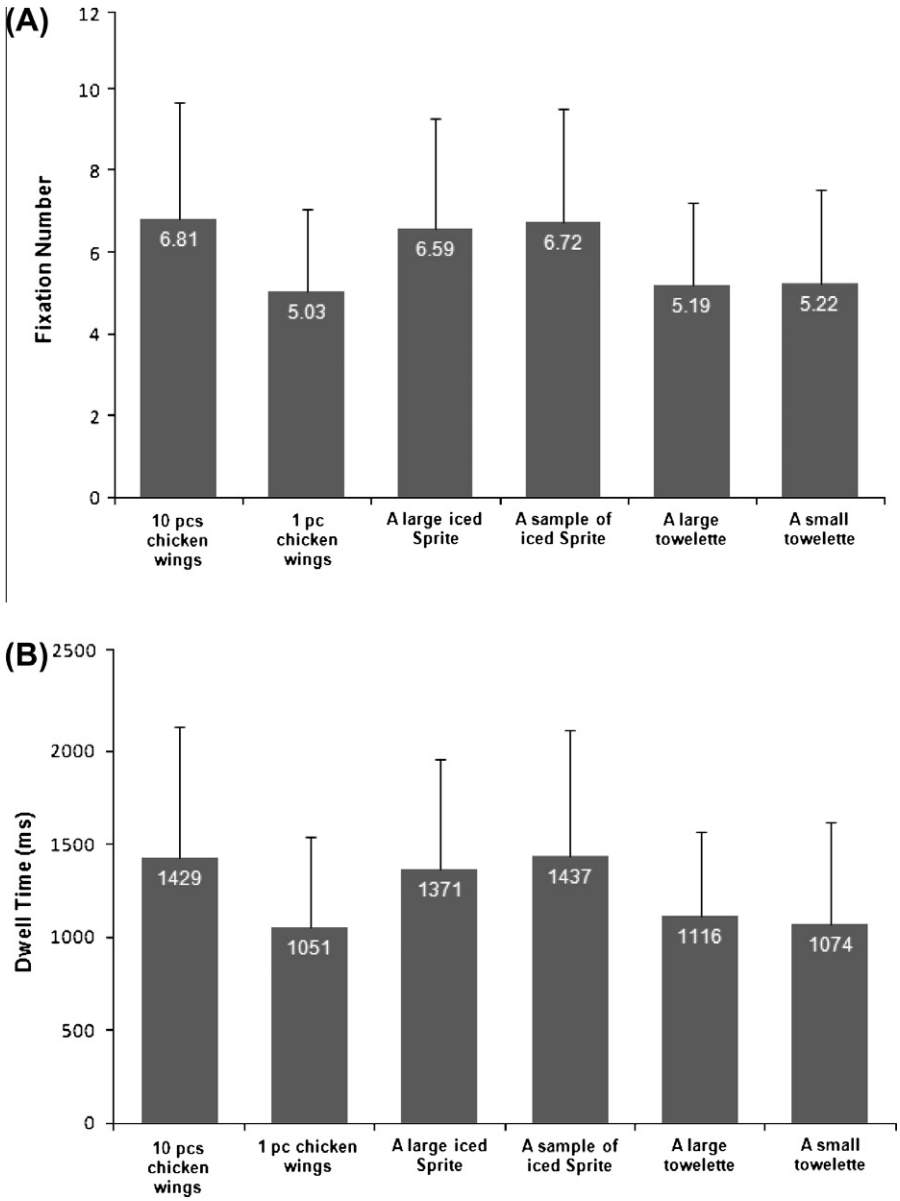

Fig. 4. Mean number of fixations (panel A) and dwell time (panel B) for common features.

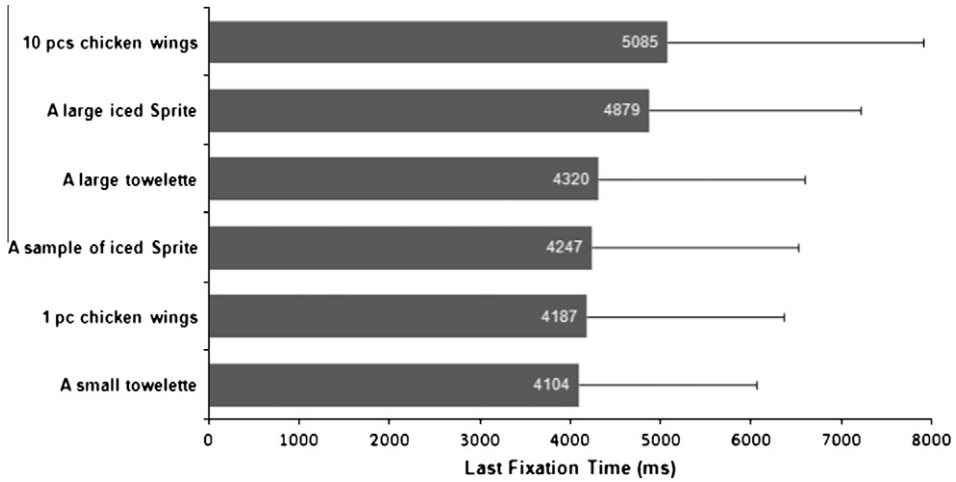

Fig. 5. Mean onset time for the last fixation on common features.

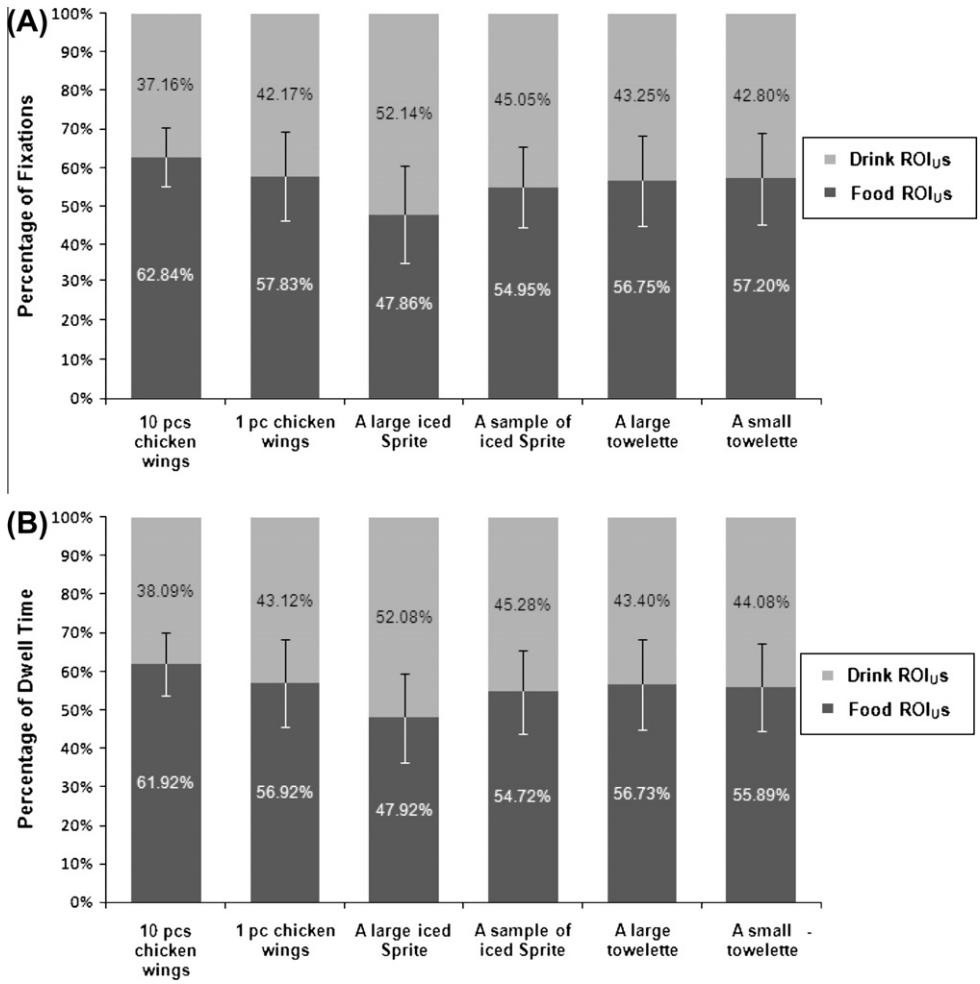

Fig. 6. The percentage of fixations (panel A) and dwell time (panel B) in the food and drink ROI_Us.

The panel A of Fig. 4 presents the mean number of fixations in ROI_C as a function of the common feature. As predicted, there was a significant effect of common features on the number of fixations ($F(5,270) = 9.87$, $p < .001$, $\eta^2 = .16$). The LSD

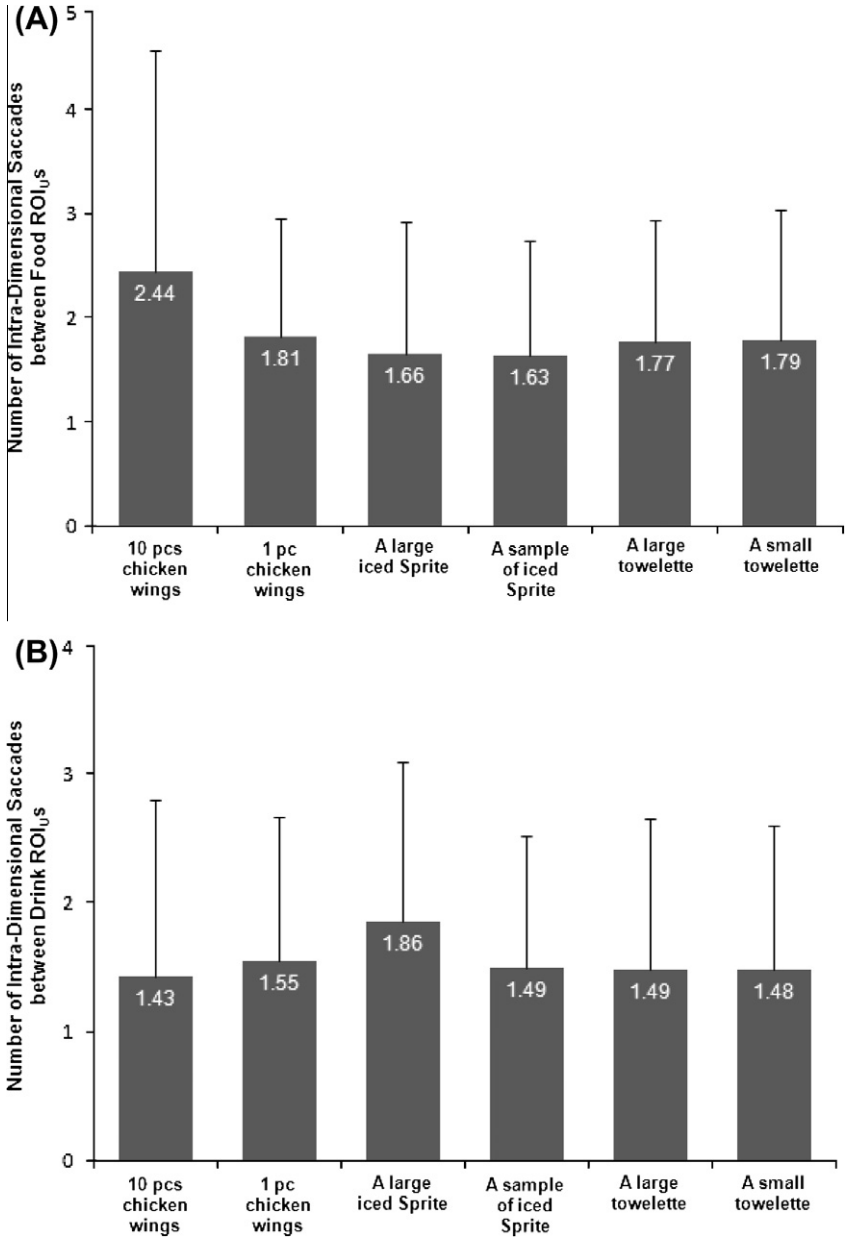

Fig. 7. Mean number of intra-dimensional saccades between food ROI$_U$s (panel A) and drink ROI$_U$s (panel B).

pairwise comparison tests revealed that significantly more fixations occurred toward "10 pcs chicken wings", "a large iced Sprite" and "a sample of iced Sprite" than toward other common features (*ps* < .01).

The panel B of Fig. 4 presents the mean dwell time in ROI$_C$ across categories, which duplicated the pattern found for the mean number of fixations with a significant main effect of common features ($F(5,270) = 8.40$, $p < .001$, $\eta^2 = .14$). LSD pairwise comparison tests confirmed that the overall amount of time that the participants gazed at "10 pcs chicken wings", "a large iced Sprite", and "a sample of iced Sprite" was significantly greater than the gaze time for other common features (*ps* < .01).

These findings revealed that different common features attracted different levels of attention. On average, common features that were found to influence participants' preferential choices attracted more attention than those with no impact. These results were consistent with predictions. However, an out-of-pattern score (OOPS) indicated that participants also paid more attention to "a sample of iced Sprite", which did not influence preferences. Because the phrase "a sample of" is rarely used in Chinese, the novelty of this stimulus might explain this eye movement finding.

Fig. 5 indicates the onset time for the last fixation on the common feature. As predicted, there was a significant main effect of common features ($F(5,270) = 2.88$, $p = .015$, $\eta^2 = .05$). Further analyses revealed that the last fixation fell on "10 pcs

chicken wings" and that "a large iced Sprite" appeared significantly later than other common features, such as the sample of iced Sprite ($ps < .05$).

These results revealed that the relevant common features in greater quantities that affected preferential choice were more attended to during the comparison process and continued to be processed at later stages of decision making. In contrast, relevant common features in smaller quantities and irrelevant common features that did not affect preferential choice ceased to be attended to at earlier stages of processing. These results also revealed that the unexpectedly high level of attention to "a sample of iced Sprite" occurred only at the beginning of the decision making process and rapidly disappeared as processing continued. These findings provide circumstantial evidence that the unexpected amount of attention to the sample of iced Sprite was due to the novelty of the stimuli.

4.2.3. Attention to unique features

To compare attention to the unique features of different dimensions for each binary choice, we measured the number of fixations and dwell time in each ROI_U, and calculated the percentage of fixations and the percentage of dwell time for both food and drink ROI_Us. We also measured the number of intra-dimensional saccades for both the food and drink dimensions to obtain direct evidence of the comparison process between options. We hypothesized that during the proposed reevaluation process, particular attention would be directed to the dimension in which differences between alternatives were being reevaluated, and more saccades would be observed. One-way repeated measures ANOVAs were performed in the following analyses.

The panel A of Fig. 6 presents the mean percentage of fixations in both the food and drink ROI_Us as a function of the common feature. As expected, the main effect of common features was significant ($F(5,270) = 12.55$, $p < .001$, $\eta^2 = .19$). LSD pairwise comparison tests revealed a significantly greater percentage of fixations in the food ROI_Us when "10 pcs chicken wings" was added to both options ($ps < .01$). Similarly, a significantly greater percentage of fixations in the drink ROI_Us occurred when a large Sprite was added ($ps < .01$).

The panel B of Fig. 6 presents the results for the percentage of dwell time, which exhibited the same pattern that was found for the percentage of fixations. The main effect of common features was significant ($F(5,270) = 11.13$, $p < .001$, $\eta^2 = .17$), and the percentage of duration in the food ROI_Us was significantly greater for 10 pcs of chicken wings than for other common features ($ps < .01$) but was smaller when a large Sprite was the shared item ($ps < .01$).

The number of intra-dimensional saccades in the food and drink ROI_Us were each analyzed using a repeated measures ANOVA (see Fig. 7). A significant effect of common features was seen in the food dimension ($F(5,270) = 3.44$, $p = .005$, $\eta^2 = .06$). Further analyses revealed a significantly greater number of intra-dimensional saccades in the food ROI_Us when adding "10 pcs chicken wings" to both options ($ps < .05$). The effect of common features on the number of intra-dimensional saccades with regard to drinks did not achieve statistical significance ($F(5,270) = 1.404$, $p = .24$). However, further analyses found a greater number of intra-dimensional saccades in drink ROI_Us when a large cup of Sprite was added to both options ($ps < .08$), and these effects were significant or marginally significant.

Based on the previous analyses, we hypothesized that adding a relevant common feature would lead individuals to reevaluate the intra-dimensional difference between alternatives by taking common features into account. The analysis of the percentage of fixations and dwell time with regard to food and drink ROI_Us across feature manipulations revealed that the emphasis shifted toward food when chicken wings were added and toward drinks when Sprite was added. Together with the number of intra-dimensional saccades, these results supported the claim that a reevaluation process underlies the effect of relevant features on preferential choice. However, when the quantity was small (1 pc chicken wings or a sample of Sprite), these differences did not reach statistical significance, indicating that adding these common features did not affect the perceived difference between the options. The change process failed to occur after a short-lived reevaluation process.

5. General discussion

The cancellation-and-focus model (Houston & Roskos-Ewoldsen, 1998; Houston & Sherman, 1995; Houston et al., 1991), which was developed to model human preferential choice behavior when individuals were faced with alternatives that included common features, claims that features that are shared by options are canceled out while unique features that distinguish between alternatives play a role in the choice process. The three experiments reported in this paper revealed that the cancellation-and-focus model did not apply to all cases. The study findings indicated that common features significantly affect consumer preference when the following two conditions are simultaneously satisfied: (1) the common feature of the alternatives shares the same dimension as one of the unique features and (2) sufficient quantities of the common feature are supplied. When these conditions are met, the common feature is not canceled out and the cancellation-and-focus model does not apply.

5.1. Influential factors ignored in the cancellation-and-focus model literature

Studies in diverse fields employing different methodologies have provided a large body of evidence to support the cancellation-and-focus model in predicting immediate judgments (Hodges, 1997, 1998; Hodges et al., 2002; Houston & Sherman, 1995; Houston et al., 1989, 1991; Mantel & Kardes, 1999; Sanbonmatsu et al., 1991; Slaughter & Highhouse, 2003;

Sütterlin et al., 2008; Wang & Wyer, 2002), although this model has been shown to fail to predict delayed judgments (Brunner & Wänke, 2006; Nagpal, Khare, Chowdhury, Labrecque, & Pandit, 2011; Wang & Wyer, 2002; Wänke, Bless, & Igou, 2001). Now, the question becomes why this plausible and tested model would actually fail to predict the immediate judgments in certain conditions. We suggest that two factors that might influence the predictions of the cancellation-and-focus model have been ignored in the literature.

The first factor is the quality of the common features. Because common features that were added to option pairs were "specifically" designed to add a new dimension in many earlier studies, it is not surprising that adding these irrelevant features to the option pairs did not influence people's preferential choices. However, the results of these studies cannot be generalized to all common features.

As a result, some researchers have reexamined the effect of common features on preferential choice by manipulating the quality of common features. For example, Chernev (2001) found that the impact of common features was partially moderated by their attractiveness, and Li et al. (2007) found that only "irrelevant" common features were canceled. In the present study, we adopted procedures employed by Li et al. (2007) to manipulate the quality of the common feature and extended these procedures by also manipulating the quantity of the common feature, which was not performed in previous studies. We found that whether or not adding a common feature influenced consumer choices depended on its quantity as well as its quality. Thus, the quantity of common features is a second factor that has been ignored in the research literature. The present study, which investigated these two factors, provides further insight into the conditions under which the cancellation-and-focus model applies.

5.2. Theoretical implications

The debate on whether consumer choices are based on an alternative-based process or an attribute-based process has a long history. Previous studies have found that attribute-based strategies characterize the first stage of processing, which eliminates options to provide a manageable set of alternatives (Bettman & Park, 1980; Gilbride & Allenby, 2004). Once the choice problem is simplified, individuals become more likely to use alternative-based strategies.

The theoretical analysis and the three experiments reported in this paper provide further insight into the general issue of consumer choice. On one hand, study results imply that individuals are reluctant to follow an alternative-based strategy in consumer choice even for the simplest problem. A common prediction that can be deduced from the family of alternative-based models is that adding an explicitly common feature that contributes equally to the overall evaluation of each option does not affect preferential choice. However, consistent with those in Li et al. (2007) and Chernev (1997, 2001), the findings of the present study indicate that common features do influence preferential choice in certain conditions. Study results violate the prediction of alternative-based models, implying that consumer choices are actually not guided by an alternative-based process. On the other hand, study results imply that individuals are more likely to follow an attribute-based tradeoff strategy in consumer choice. According to the mediation analysis in the present study, the extent to which the intra-dimensional differences were taken into consideration was able to predict consumer preferences. Together with the results of the eye movement analyses, the study findings indicate that consumers accept a tradeoff between differences across dimensions in determining the key dimension on which to base their final choices. Specifically, they first evaluate the differences between options on all the dimensions. Then, they trade off between these intra-dimensional differences, equating the less significant differences and making their final choices based on the greatest intra-dimensional difference.

Previous studies that investigate risky choices (Brandstätter, Gigerenzer, & Hertwig, 2006, 2008a, 2008b; Li, 2004) and intertemporal choices (Read & Scholten, 2012; Scholten & Read, 2006, 2010) suggest that people do not weigh and sum up all available information (probabilities and outcomes in risky choice, and time and outcomes in intertemporal choice) to generate an overall choice reference value (the expected value in risky choice and the discounted value in intertemporal choice). Recently, the attribute-based tradeoff model (Scholten & Read, 2010) and the extended tradeoff model (Read & Scholten, 2012) have been developed to describe intertemporal choices of individuals. From the perspective of consumer choice, the present study adds to the wealth of evidence, implying that people are more likely to use attribute-based tradeoff strategies over alternative-based integration strategies in daily decision making, possibly because of their limited processing capacity.

5.3. Practical Implications

The primary practical implications of study findings suggest that marketers could affect consumer preferences by manipulating the choice set of multiple-attribute alternatives. To survive in today's competitive market, marketers must intensify efforts to make their products more attractive and stay one step ahead of competing brands. The influence of common features found in this study provides another method for achieving this aim because marketers should consider not only the unique features of their brands but also the features their product shares with available alternatives. Marketers and consumers might not realize that adding a common component to available options influences preferential choices. However, common features do matter, and marketers might alter consumer decisions if they add a feature that their competitors have already included. For instance, a MP3 player manufacturer could offset the product disadvantage such as low durability by providing the same long-term warranty period as his or her competitors while highlighting an additional advantage, such

as price or aesthetic appeal. In the same vein, because preferential choice among multiple-attribute alternatives also occurs frequently in many other industries, these tactics could be generalized to the realms of employee motivation and politics.

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