



# Relationship Between the Use of Cognitive Heuristic and Customers' Digital Shopping Behavior in China During Online Shopping Festival

Chuxin Yu (✉)

University College London, London, UK  
chuxin.yu.20@ucl.ac.uk

**Abstract.** Cognitive heuristics, pioneered by two renowned psychologists Tversky and Kahneman, explains why individuals sometimes make “bad decisions”. Framing bias and anchoring and adjustment describe the situation in which individuals are influenced by both the way a description is worded and the initial valued, the “anchor”, of a product in the process of decision-making. Knowing customers' tendency to use cognitive heuristic, Chinese e-commerce started to develop various marketing and promotional strategies, such as 618 online shopping festival characterized by huge discounts. Previous studies suggest that customers' over-spending and impulsive shopping arise from the use of cognitive heuristic. The present study distributed two sets of online questionnaires and carried out a correlational analysis. The results suggested a significant but weak positive correlation between customers' use of cognitive heuristic and their mobile shopping behavior. Accordingly, future research is encouraged to recruit unbiased sample and divide participants into different age groups to explore age-specific preference of online shopping.

**Keywords:** Behavioral Economics · Cognitive Heuristics · E-Commerce · China · Framing Bias

## 1 Introduction

Judgmental heuristics, also known as mental shortcuts, or rules of thumb, are characterized by an “automatic, intuitive, and rapid” system of thinking, which works against the “effortful system” that usually yield conscious and deliberate solutions [1]. Despite that the use of rules of thumb reduce cognitive and time constrains, over-reliance on heuristics would results in systematic errors and undesirable outcomes, such as impulsive buying behaviors in the context of online purchasing [2], in decision making regarding novel solutions [3]. On the other hand, China has experienced a rapid expansion of e-commerce and platform economy in recent years. Moreover, not surprisingly, platform enterprises take advantages of cognitive heuristics and influences customers' purchasing through various means, including discounting, framing of product descriptions etc. By

finding out customers' shopping patterns in relation to e-commerce marketing strategies, customers could be aware of their digital purchasing patterns and hopefully reduce the phenomenon of impulsive shopping and unnecessary overspending. Therefore, it is of interest for the present study to examine the correlation between customers' level of consideration and thinking pertaining to cognitive heuristics and their shopping behavior during online shopping festivals in China. The following study purports to design a questionnaire assessing participants' heuristics scale (construct 1) and their purchasing behavior (construct 2) and subsequently carries out a correlational analysis. The research hypothesis is that there is a positive correlation between the use of cognitive heuristic and online shopping behaviors.

## 2 Literature Review

### 2.1 Framing Bias

Framing bias is highlighted by individuals' inconsistent decision-making behavior when identical attributed outcomes are worded differently, either in a positive or negative way [4]. Previous literature on human's decision-making was dominated by Expected Utility Theory, proposed by Daniel Bernoulli, which suggests that under uncertain situations, human make rational choices that maximize their gains and lead to the highest expected utility. Nevertheless, in various empirical studies, the theory of Expected Utility was violated; thus, Tversky suggested the Expected Utility Theory (EUT) was "grossly inadequate as a descriptive model of individual choice behavior (p.163)", especially when emotion is involved in an uncertain task [5]. In Tversky and Kahneman (1981)'s well-known study of "Framing of Act", participants faced the following pair of concurrent decisions (see Table 1), and they were asked to examine the options and chose the ones they prefer.

By adopting mathematical calculation, the paired choice of B/C yielded the value of -£500 while the paired choice of A/D yielded -£520; however, the majority of participants selected the combination of A/D instead of the optimal combination of decisions:

**Table 1.** A "Framing of Act", adopted in Tversky and Kahneman (1981, p. 454) [4] (The Source allows reusers to distribute, remix, adapt, and build upon the material in any medium or format, so long as attribution is given to the creator. The Source allows for commercial use)

Decision 1: Choose between	Results	Expected Utility
A: a sure gain of £240	84 percent	£240 ( $1 * £240$ )
B: 25% probability to gain £1000, and 75% probability to gain nothing	16 percent	£250 ( $.25 * £1000 + .75 * £0$ )
Decision 2: Choose between		
C: a sure loss of £750	13 percent	-£750 ( $1 * -£750$ )
D: 76% probability to lose £1000, and 24% probability to lose nothing	87 percent	-£760 ( $-.76 * £1000 + .24 * £0$ )

B/C. This, as elucidated in Tversky and Kahneman (1981), is because that human hate loss, and they tend to be risk averse in choices involving gains, whereas they switch to be risk seeking in tasks involving loss, which forms the gist of the Prospect Theory. Prospect Theory, in contrast to the EUT, takes into account of individuals' emotions at the "reference point" and suggests people value gain and loss differently, attaching more weight on perceived loss than potential gains. Thus, in order to avoid loss, individuals have a natural tendency for positivity. Subsequently, commercials started to take advantage of customers' tendency of favoring positively framed options and develop various marketing strategies. For instance, one study has asked participants to choose between "80% lean meat" and "20% fat meat" describing certain type of ground beef, and with no surprise, participants in the positively frame condition had a better impression to the product while the later did not [6, 7]. Nowadays, with emerging advancement of technology, not only was Framing Bias being studied on the behavioral level using reality-simulated tasks, the underlying neural mechanisms of Framing Effect was also explored. Jin et al. (2017) conducted neuroimaging to examine the neuron activity of participants, and Jin and colleagues found out that higher purchase intention was paired with shorter reaction time under positive framing messages relative to negative ones [7]. Moreover, while messages were framed negatively, participants activated greater cognitive resources, resulting in cognitive conflicts and decision difficulties. Thus, this helps to illustrate that people prefer positively framed options and make intuitive decisions under such circumstance.

## 2.2 Anchoring and Adjustment Bias

Anchoring and Adjustment Bias was first proposed by Tversky and Kahneman (1974), which suggests individuals make insufficient adjustment to yield a final estimation based on the "anchor" - the initial value presented to them [3]. Anchor might be a useful cue when individuals are asked to make unknown estimation; however, over-reliance on this initial value oftentimes result in undesirable outcomes and absurd values. For instance, in Strack and Mussweiler (1997)'s original study of anchoring bias, a sample of 69 German undergraduates was recruited from the university canteen at lunchtime, and they were asked if they would take part in a general knowledge questionnaire [8]. The participants answered questions including two components on a computer: (1) Did Mahatma Gandhi die before or after the age of 9? (2) Did Mahatma Gandhi die before or after the age of 140? These two questions have different, either high or low anchors, and both anchors seem implausible. Then Participants were asked that "How old was Mahatma Gandhi when he died?" The actual answer is 78. Nonetheless, the results revealed that participants with high anchor answered an average age of 66.7, while people who surveyed with low anchor had an average answer of 50.1, suggesting people's decision making is highly dependent on the anchor, or the first information that seems most relevant to them.

In additional, the application of anchoring bias is commonly found in marketing, in particular product discounting. For instance, during online purchasing and especially discounting seasons, it is oftentimes observed that a product was discounted to be far below the original price. Suppose the product is priced \$199 with a limited time promotion of \$100, it is likely that customers are attracted by the discounting despite \$99 might be the authentic price. According to Liu et al. (2022), online buyers are influenced

by the anchor of “\$100 coupon” and hence are willing to place orders [2]. Furthermore, previous literature has suggested online shoppers are not only anchored by product prices, but they are also anchored by quality, online evaluation (shoppers’ reviews) and comparative information from competing merchants [9]. Today, with the maturation of online distribution channels and customers’ data collection, platform enterprises have found a way to maximize profit gains while offering discounting price to a desirable level among customers. Specifically, platform vendors advertise their products before the official release of the product that cost more than the anchoring pricing point to improve the anchor and reduce customers’ price sensitivity, thus relaxing the pricing range and gaining more profit [2], which is a frequently use mean of attracting online customers during online shopping festivals discussed in the following section.

### **2.3 E-commerce**

In recent decades, China has witnessed a growing demand of online shopping, which leads to more scholar investigation to platform economy, defined as social and transactional activities reinforced by online platforms [2]. The most outstanding and well-known platforms are Taobao, Tmall, Jingdong and various others. Notwithstanding, there are also a group of emerging e-commerce platforms characterized by selling products at retail prices, or lower prices relative to others, such as Pinduoduo. By 2021, digital buyers’ penetration rate in China has approached to 57%, 60 million increases in online shoppers from last year [10]. In addition to traditional online shopping, e-commerce in China have developed diverse innovative shopping festival attracting customer purchases. Oftentimes, shopping festivals, including 618 and Double 11 Shopping Festivals, are featured by deliciated campaigns and various promotional discounts. Taking 618, event lasted from June 1st to June 18th, as an example, the total transactions at JD, excluding other platforms, has grown 28% relative to the previous year. And the rise in sale has contributed to 51% increase in net revenue year-on-year [11].

## **3 Method**

### **3.1 Design**

A non-experimental questionnaire design was carried out online, consisting of two close-ended demographic questions and 9 Likert-scale questions. The two variables of interest are participants’ Heuristic and Bias Scale (HBS) and their online purchasing behavior.

### **3.2 Participants**

An opportunity sample consisting of 52 participants took part, in which the majority was the author’s friends and family members. Participants included in the study are from China - 14 are males, and 38 are females, with an average age of 26.04 years (SD = 8.57).

### 3.3 Materials

Participants' demographic information was collected with two close-ended questions asking age and gender. Additionally, HBS (construct one) questionnaire was designed referring to Aczel et al. (2015) [12], in which two questions regarding framing effect were directly adopted from Aczel et al. (2015) [12]. This questionnaire assessed participants' use of cognitive heuristic using a five-point Likert-scale ranging from totally disagree (1) to totally agree (5), in which Question 1&3 assess the framing effect and Question 2&4 assess the anchoring bias. In this set of questions, Question 1&4 were negatively coded and data needed to be reversed before proceeding to analysis. Overall, this questionnaire exhibited a favorable level of internal consistency:  $\alpha = .64$ .

Customers' online purchasing behavior (construct two) was designed following the current trend of Chinese online shopping festivals, including five items rated on a five-point Likert-scale assessing customers' attitude and online orders, ranging from totally disagree (1) to totally agree (5). This set of questionnaire contains one negatively coded question: "even though an item drops from 2999 to 1999 yuan, I won't buy it as long as I don't need it". And overall, the customers' online purchasing construct exhibited a high level of internal consistency,  $\alpha = .80$ .

## 4 Result

### 4.1 Descriptive Statistics

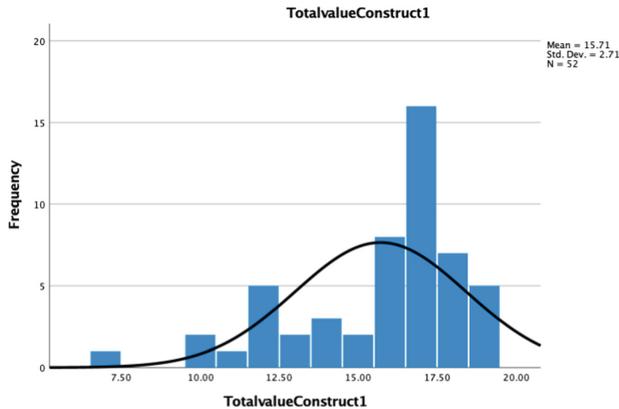
Sample's demographic characteristics can be found in Table 2. In addition, descriptive statistics with mean and standard deviation of the two variables of interest were compiled in Table 3. Beyond that, the test of normality was operated twice to find out the central dispersion of the two constructs, which are shown in Graph 1 and Graph 2. Outcomes suggest that even though the total scores of HBS and customers' shopping behaviors against the numbers of participants (frequency) did not display normal distribution, Pearson's correlation was run for inferential statistics due to the relatively large sample size ( $n = 52$ ), and continuous data across two constructs (Figs. 1 and 2).

**Table 2.** A ( $N = 52$ ) Participants' demographic characteristics (The Source allows reusers to distribute, remix, adapt, and build upon the material in any medium or format, so long as attribution is given to the creator. The Source allows for commercial use)

Age Distribution	N	Percentage
11–20	16	31%
21–30	23	44%
31–40	7	13%
41–50	6	12%
Gender		
Female	38	73%
Male	14	27%

**Table 3.** Descriptive statistics for the total scores of HBS and Customers’ Shopping Behaviors (The Source allows reusers to distribute, remix, adapt, and build upon the material in any medium or format, so long as attribution is given to the creator. The Source allows for commercial use).

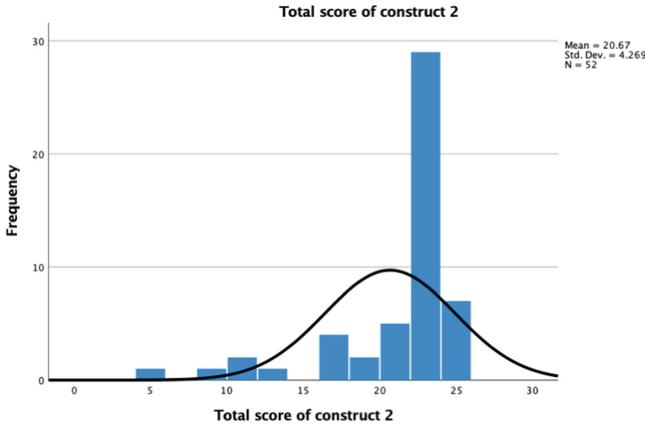
Total scores	Mean	Standard Deviation	Number of Participants
Total HBS	15.71	2.71	N = 52
Total Customers’ Shopping Behaviors	20.67	4.27	N = 52



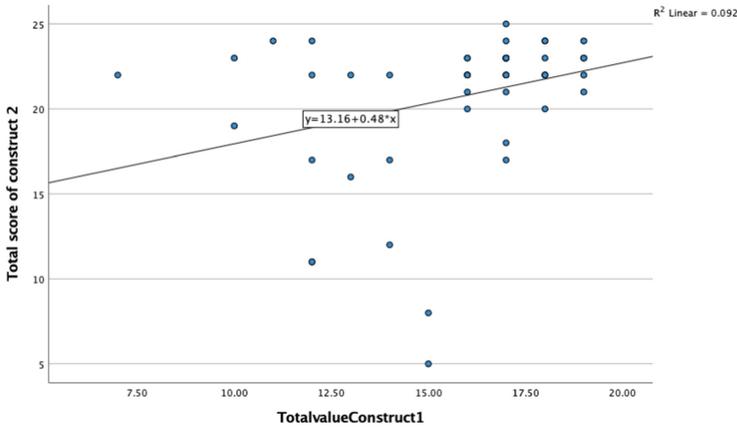
**Fig. 1.** Histogram of Total HBS (The Source allows reusers to distribute, remix, adapt, and build upon the material in any medium or format, so long as attribution is given to the creator. The Source allows for commercial use)

### 4.2 Inferential Statistics

The correlation between HBS and customers’ shopping behavior was analyzed with a two-tailed Pearson’s correlation test. The result suggests: among the current sample, there is a statistically significant weak positive association between HBS and customer’s online shopping behavior. This suggests increasing use of heuristic and bias in problem-solving is associated with an increase of online shopping behavior (see Fig. 3),  $r(52) = .30, p < .05$ .



**Fig. 2.** Histogram of Total Customers' Shopping Behaviors (The Source allows reusers to distribute, remix, adapt, and build upon the material in any medium or format, so long as attribution is given to the creator. The Source allows for commercial use)



**Fig. 3.** Scatter plot of HBS against Customers' Shopping Behaviors (The Source allows reusers to distribute, remix, adapt, and build upon the material in any medium or format, so long as attribution is given to the creator. The Source allows for commercial use)

## 5 Discussion

Cognitive heuristic receives increasing attention in recent decades, especially witnessing online shoppers' growing impulsive willingness to spend more on e-commerce platforms during online shopping festivals, namely Double 11 and 618. This study has contributed to understanding the real-life application of cognitive heuristic in marketing by performing a correlational analysis between cognitive heuristic use and customers' online purchasing behavior. In line with previous studies [2, 7], the current study found that higher use of cognitive heuristic and bias is notably correlated with increasing online shopping behaviors, in which a statistically significant weak positive correlation was

discovered between the two variables of interests, thereby accepting the research hypothesis. To illustrate, Liu et al. (2022) claimed that shoppers are easily influenced by the price anchor offered by platform enterprises [2]; especially when customers see a large amount discount, they tend to favor the product unconsciously. Likewise, in this study, 82.69% of the respondents strongly agreed that “when the 618 online shopping festival offers the promotion that ordering over 300–50 yuan, I will do online shopping.” Moreover, it seems like online customers see online shopping festivals as an opportunity to shopping, where 46.15% agree and 42.31% strongly agree that “they spend more than usual.” Taken together, these results suggest e-commerce vendors are taking advantages of customers’ natural tendency of using cognitive heuristic, incorporating and utilizing online shoppers’ automatic system of thinking to advertise products, eventually resulting in desirable sale revenues.

## 6 Conclusion

To summarize, with the rising popularity of online shopping, platform enterprises utilize customers’ system 1 thinking and their use of cognitive heuristic during decision-making process. Similarly, extensive research has suggested that increasing use of cognitive heuristic is correlated with increasing online shopping behavior. The present study found similar and significant pattern, yet with weak correlation. Postulation to the less desirable correlation lie in the sampling gender/age bias and participants’ variability, which exacerbate the individual difference in terms of preference over and attitude toward mobile shopping. Thus, future study is suggested to recruit equally divided by gender sample and allocate them into various age groups if participants interested.

To illustrate the limitation, concerning the sample’s demographic features, this study was compounded by a blending of age and gender differences; thus, participants’ variability pertaining to their preference to and frequency of online shopping and their attitudes towards e-commerce might have influenced the study’s result, presented to be a confounding variable. Statistic has suggested that by 2020, the most frequent online shoppers are constituted by 24–30-year-olds (32%) [13]. However, the present study incorporated a mix of different age groups, with the smallest participant of the age of 15 and the 48-year-old being the oldest. Moreover, females and males’ shopping patterns greatly differ from each other, thus influencing the study’s data. Therefore, it is recommended for future study to divide participants into different age distribution groups and gender groups to have a clearer and more specific grasp of participants’ shopping behavior.

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