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A Study of Choice Overload Measurement in Food Consumption

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Abstract

Consumers are presented with increasingly difficult choice tasks and are experiencing more choice overload during the decision-making process. Based on the emotion-imbued choice model and incorporating subjective state consequences into the framework of experienced utility, this research constructed a systematic scale to measure choice overload in several decision-making stages. This research conducted three experiments using liquid milk as a consumption product to test whether choice overload would be influenced by increasing the number of attributes, adding similar options, and information nudges, and whether this effect would be heterogeneous in consumer characteristics. Results indicate that more attributes and the addition of similar options would increase the perceived difficulty of choice and result in negative emotions, while information nudges might lessen choice overload and help consumers make decisions. Besides, consumers' pursuit of maximization also determines their perceived choice overload; maximizers are more likely to experience choice overload than satisficers.

JEL Codes: D11; D12; D91

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Keywords: choice overload; experienced utility; subjective state consequence; choice overload measurement

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1 Introduction

Consumers are faced with a greater range and quantity of available products, significantly increasing their selection of alternatives. However, in contrast to the commonly accepted viewpoint that "consumers are better off with a larger choice set," considerable literature indicates that providing an excessive number of choices could lead to intrapsychic conflict, which would then affect behavior and mental health (Lipowski, 1970; Park and Jang, 2013; Reutskaja et al., 2018). Choice overload occurs when he/she must resolve decision-making challenges involving cognitive resources beyond his/her capacity (Simon, 1955; Toffler, 1970; Chernev et al., 2015). Chernev et al. (2014) claimed that choice overload appears as both observable behavioral outcomes and subjective states. The former is manifested in choice deferral, avoidance of decision-making, and choice reversal; while the latter is dissatisfaction with the current choice (Park and Jang, 2013; Claudia and Kahn, 2014; Yun and Duff, 2017; Chan and Wang, 2018), post-purchase regret (Sharma and Nair, 2017; Scheibehenne et al., 2010), disappointment and other negative emotions.

While measuring the subjective state consequences, the most commonly used metrics are satisfaction (Chernev, 2003a, b; Mogilner et al., 2008; Inbar et al., 2008; Botti and Iyengar, 2004) and anticipated regret. However, presenting too many choices to consumers could also trigger other emotions (Ackerman and Gross, 2003; Szykman, 1999), including confusion (Lipowski, 1970), disappointment (Loewenstein et al., 2001), depression (Chernev, 2003b), anxiety (Fasolo et al., 2007; Loewenstein et al., 2001; Park and Jiang, 2013; Lipowski, 1970), stress and fear (Iyengar, Wells and Schwartz, 2006; Walsh and Mitchell, 2010). Moreover, the frequently employed retrospective evaluation method to measure satisfaction in experimental research is unable to capture consumer's emotional changes (Prayag et al., 2017) and is insufficient to reflect the complete spectrum of their emotional experience; instead, it merely records the positive or negative

extreme of consumers' emotions, such as satisfaction or dissatisfaction.

The primary factors of choice overload are features of decision tasks and characteristics of decision makers. On the one hand, features of decision tasks mainly choice set complexity (Greifeneder et al., 2010; Chernev, 2003b) and decision task difficulty (Iyengar et al., 2006; Inbar et al., 2011; Ratner & Kahn, 2002) resulting from it are found to influence choice overload. Choice set complexity is related to the quantity, complementarity, comparability of attributes, availability of dominant options, and size of choice sets (Townsend and Kahn, 2014). Among these factors, the size of choice sets was commonly believed to impact choice overload (Iyengar and Lepper, 2000; Scheibehenne et al., 2010), while it is neglected that the quantity of attributes equally influences choice set complexity and then influences consumer decision (Malhotra, Jain, and Lagakos, 1982), goods with more attributes are more complex and harder for consumers to understand, hence leading to higher cognitive costs (Burnham, Frels, and Mahajan, 2003).

On the other hand, consumer characteristics, especially their decision style, play an essential role in choice overload. Schwartz (2002) developed a 13-item scale, categorizing decision-makers into "satisficers" and "maximizers," varying in the pursuit of maximizing. Maximizers are more likely to experience choice overload (Fasolo et al., 2009; Polman, 2010) and negative emotions (Chowdhury et al., 2009; Ma and Roese, 2014; Schwartz et al., 2002; Schwartz, 2004; Kamiya et al., 2021), because they spending more time searching for and comparing products (Luan and Li, 2017b; Sparks et al., 2012) to reach the best decisions (Liu et al., 2015). On the contrary, satisficers might employ heuristic strategies; they weigh the cognitive expense of choosing the best option against its utility (Christensen-Szymanski, 1978, 1980). In addition to its causes, ways to alleviate choice overload also catch our interest. Literature suggests that choice overload can be reduced by decreasing the choice set's size, removing irrelevant information, and maintaining pertinent information (Liu et al., 2017).

To investigate how the number of attributes, the addition of similar options, and the information nudge would affect choice overload and the heterogeneity of consumers, this paper developed a systematic scale to measure the subjective consequence of choice overload and conducted three experiments using liquid milk as hypothetic consumption goods. Liquid milk products were chosen because they are frequently consumed, and there is a wide variety of liquid milk products with more and more features available on the market.

2 Scale Construct

The concept of utility includes both experienced utility and decision utility, as noted by Kahneman (2000). Hedonic sensations related to decision behavior are reflected in experienced utility (Kahneman and Sugden, 2005; He et al., 2014). Instant utility, which assesses hedonic and affective feelings derived from instantaneous subjective reports of current experience or physiological indicators, is the fundamental component of experienced utility. Given the definition of choice overload, quantifying the subjective state consequence in the context of experienced utility—which encompasses a range of emotions—will help improve choice overload measurement methods and enhance their economic justification. According to a behavioral economics variation of the utility model, the experienced utility also significantly affects customers' decision-making

objectives. Hence, a novel approach to comprehending consumer decision-making is offered by measuring the subjective state effects of choice overload using experiential utility, including emotions.

Nevertheless, existing investigations lack a reliable and systematic method for measuring the experienced utility. The majority of research focused on physiological variables, including objective measures of subtle facial expressions (Frank, 1988), ranking events based on the total emotional experience's contribution (Kahneman et L., 1997), or measuring the level of happiness or suffering caused by an event (Redelmeier and Kahneman, 1996a). Concerning evaluation methods, the memory-based approach is most frequently employed, which asks participants to assess the entire event retrospectively after it has occurred. Nevertheless, as Doran and Hanss (2019) and Skavronskaya et al. (2017) point out, this retroactive method cannot capture the immediacy of consumer experience from anticipation to memory consolidation. Moreover, due to the peak-end rule, the most intense experience and the end of the event will affect the evaluation of the overall experienced utility (Redelmeier and Kahneman, 1996; Wilkinson and Klaes, 2017).

Based on the two dimensions (positive and negative) proposed by Watson and Tellegen (1985) to distinguish emotions and consider the negative impact of choice overload on consumers, this research evaluates the subjective state of choice overload through the negative dimension of emotions. Negative emotions have been shown to affect the hedonic experience of decision-making, thereby reducing experienced utility. These emotions consist of confusion (Lipowski, 1970), disappointment (Loewenstein et al., 2001), frustration (Chernev, 2003b), anxiety (Fasolo et al., 2007; Loewenstein et al., 2001; Park and Jiang, 2013; Schwartz, 2006a, b; Lipowski, 1970), stress and fear (Iyengar, Wells and Schwartz, 2006; Walsh and Mitchell, 2010). The emotion-imbued choice (EIC) model proposed by Lerner et al. (2015) offers a descriptive overview of how emotions influence the decision-making process, focusing on the emergence, persistence, and influence of emotions. In contrast to the EIC model's concentration on emotions, research on human decision-making indicates that the choice process consists of multiple stages (Payne, 1976; Glaholt and Reingold, 2011) Specifically, consumers are driven to make purchases by searching and assessing information. expanding the scope of consumer purchasing behavior to include consumption and storage after a purchase (Nicosia,1966). Five steps are included in limited and prolonged decision-making processes: problem recognition, information search, evaluation and selection, purchase, and post-purchase behavior. (Wu, 2005).

Together with the works mentioned above, this study further refines the evaluation of decisions by introducing the evaluation stage and overall evaluation, both impacting the experienced utility, as well as incorporate actual outcomes and emotional responses into the framework of the EIC model. Emotion is a complex and ever-changing process that is impacted by several elements, such as emotional evocation and event characterization (Carver, 2015). Its duration can vary greatly, ranging from a few seconds to several hours (Frijda et al., 1992; Verduyn et al., 2015). Experiments of this study permit a brief interval between decision-making and self-retrospective evaluations. So, it is possible to measure consumers' experienced utility and choice overload by obtaining participants' self-retrospective evaluations through mnemonics after decision-making. This study divides the decision-making process into four separate stages:

evaluation stage, decision stage, post-decision pre-consumption stage, and consumption stage. Corresponding scale items of the first three stages are perceived overload, evaluation costs/ inaction and delays, anticipated regret. At the same time, choice confidence and decision satisfaction are the overall feedback of the decision-making process, as illustrated in Figure 1:

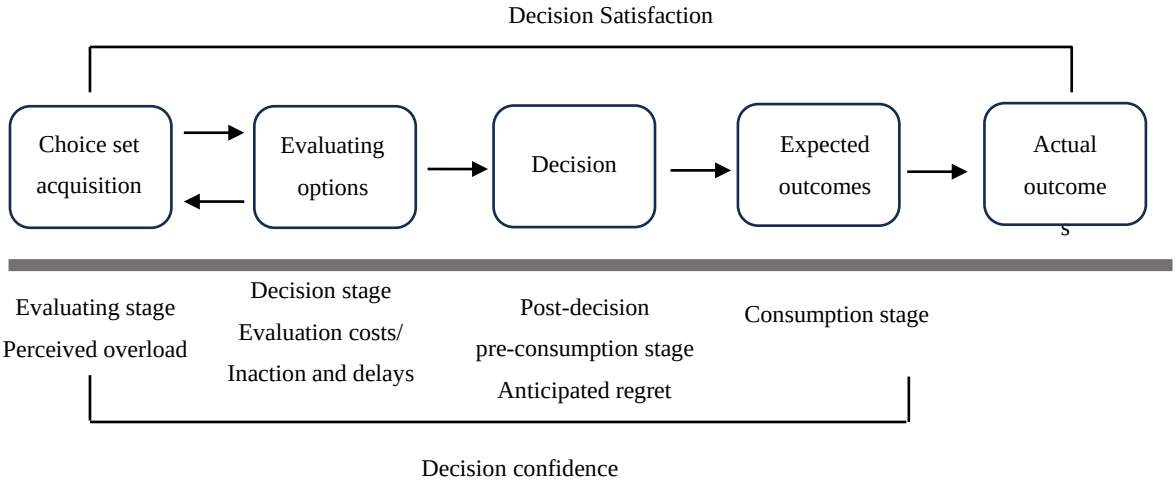

Figure 1 Decision-making process and scale items

Perceived overload. Perceived overload includes product overload, and the resulting negative emotions, where product overload is associated with the number of options and attributes. The degree to which customers experience choice overload will influence their choice goals, which will influence how they make decisions and how satisfied they are with their purchases (Heitmann et al., 2007). Negative emotions are triggered by complex choice sets that require challenging trade-offs (Luce, Bettman, and Payne, 1997; Luce, Payne, and Bettman, 1999), and persist throughout the decision-making process (Rolls, 2014). Using a consumer-style questionnaire, Sproles and Kendall (1986) outlined the traits of consumers who are overwhelmed by choice. Heitmann et al. (2007) examined how five choice objectives influence decision-making and consumer satisfaction, In their study, the following items were used to characterize the participants' perceptions of product overload: *"There are so many products to choose from that I am confused"*; *"The more I learn about these products, the more difficult it seems to be to choose the best one"*; *"When there are so many options to choose from, I have a hard time distinguishing the characteristics of these products"*; *"There are so many options that I find it difficult to compare the options"*.

Evaluation costs/ Inaction and Delays. Large product portfolios result in greater evaluation costs due to perceived overload and additional cognitive effort (Gourville and Soman, 2005). Heitmann (2007) noted that the evaluation cost will be influenced by the extent to which customers feel overwhelmed by the abundance of options; they put the following questions to quantify the evaluation cost: *"It is difficult to compare different products offered"* and *"When making this choice,*

I need to focus much energy." Meanwhile, the tendency to put off or avoid making decisions is also a negative outcome of choice overload in the option evaluation stage. According to Frost and Shows (1993), the expansion of the choice set and the difficulty of making decisions will make it more difficult for people to decide which option is best. As a result, people will become more hesitant or avoid making decisions altogether to reduce the chance of making a mistake. Mann et al. (1997) updated the Decision-Making Coping Mode Questionnaire (DMQ). They put forward a new scale with 22 items, including *"want to postpone making decisions"* and *"want to avoid making decisions."*

Anticipated regret. Anticipated regret will likely result from having a lot of options and being unable to select the best option among them (Gourville and Soman, 2005). According to studies by Zeelenberg et al (2000), anticipated regret plays a crucial role in the decision-making process and might be directly quantified by asking: *"Having made this decision, I will not regret"* (Germeijs and Boeck, 2003) or *"How much do you regret this decision considering the other options?"* (Sagi and Friedland, 2007; Schwartz et al., 2002). Several studies improved the anticipated regret scale by including the following questions: *"When I choose a product, I worry about the information I will get after buying a competing product," "When I choose a product, I am curious about what will happen if I choose a different product,"* and *"Even if I find a good choice, I am also worried that I have ignored better products "* (Heitmann et al., 2007).

Decision confidence. Decision confidence can be used to evaluate the decision-making process as a whole after it has been made (Brus et al., 2021); it is a subjective evaluation of choices without immediate feedback (Brus et al., 2021), and one of the goals of decision-making (Heitmann et al., 2007). Certainty about the choice and a propensity to remain with it are positive indicators of decision confidence. The decision maker's confidence was gauged using the following questions: *"I am confident that I can determine which product will best match my preferences"* (Heitmann et al., 2007), *"When making a decision, I feel certain," "Once I make a decision, Will stick to the decision "*(Germeijs and Boeck, 2003).

Decision Satisfaction. Post-decision satisfaction, which includes evaluating all aspects and results of the decision process, can be used to evaluate the decision overall (Reutskaja and Hogarth, 2009). Consumers are satisfied or dissatisfied with the selected products and the decision process itself (Westbrook and Newman, 1978; Westbrook, Newman, and Taylor, 1978). Therefore, the evaluation of satisfaction with decision quality includes the decision process (Heitmann et al., 2007; Fitzsimons, 2000; Botti and Iyengar, 2004) and the results (Fitzsimons, 2000). More specifically, some studies used excitement and frustration to evaluate the process of decision-making (Fitzsimons, 2000; Zhang and Fitzsimons , 1999).

3 Survey Design and methods

3.1 Attributes specification

This experiment uses liquid milk as a consumption scenario for two reasons: First, purchasing it has become a regular everyday option due to its abundant nutrients, vital for sustaining a balanced diet. Second, a wide variety of brands, packaging, and flavor combinations are available in liquid milk, leading to ongoing market divisions. This has made the choice set more complex and could lead to choice overload. Therefore, liquid milk is appropriate to as a research product in consumer

choice overload studies.

This study compiles and filters attributes that are proven to impact consumer liquid milk consumption, including price (Kubicova et al., 2019; He et al., 2016), freshness (Sekhar 2021), fat content (iklavec et al., 2015; de-Magistris and Gracia, 2016), calcium content (Xing, 2017; Ares and Gambaro, 2007; Bimbo et al.,2016), Organic (Lockie et al., 2004; Rana and Paul, 2017), protein content (Yu et al., 2013), and flavor (Drewnowski and Rock, 1995; Kourouniotis et al., 2016).

3.2 Experiment process and questionnaire structure

In this investigation, three experiments were carried out. Before and after the experiment manipulation, subjects in each experiment had to complete the Choice Overload Scale and make two choices. Following each manipulation, participants' quality perceptions and adoption of the information provided were assessed using questionnaire questions; the effectiveness of the manipulation was also tested by assessing the perceived similarity between the added option and the original option, as well as the importance of related attributes. Then Next, the participants were asked to select their next option. By analyzing the variations in the Choice Overload Scale scores following the two choices, the hypothesis of this paper is confirmed.

The questionnaires are essentially the same in all three experiments, with the exception of the questions in the experiment manipulation test. They include basic information about the subjects, their consumption habits of liquid milk, the validity test of the experiment manipulation, and a choice overload scale after the first two choices (all scales are measured on a 5-point scale, with 1 = very inconsistent and 5 = very consistent). The information is displayed in Figure 2.

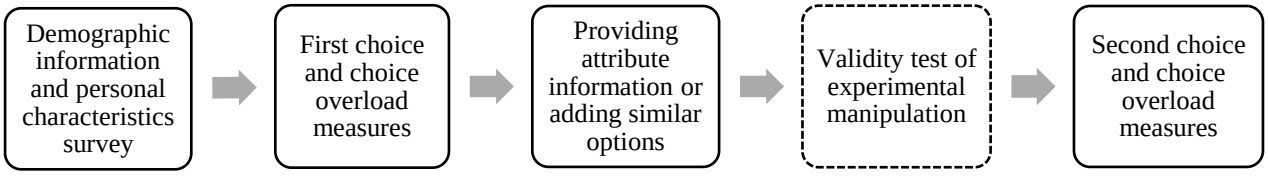

Figure 2 Questionnaire content and experiment flow

3.3 Experiment design

To compare the changes in consumers' negative emotions and satisfaction brought by the addition of attributes and addition of options, the choice set's complexity varies in two ways: 1) increasing only the number of product attributes (Experiment 1, small complexity increases) and 2) increasing both the size of the choice set and the number of attributes (Experiment 2, high complexity increase). This study also investigated whether giving subjects positive information about a particular product attribute (low-fat) while maintaining an unchanged choice set and the same number of attributes can decrease consumers’ negative emotions and enhance their decision

satisfaction and confidence (Experiment 3).

This study will examine the following hypotheses by comparing the data from Experiment 1 and Experiment 2:

H1: Increasing the complexity of the choice set will significantly enhance the negative emotions consumers report.

H1a: Maximizers are more likely to report negative emotions after the choice set becomes more complex than satisficers (H1a).

The following hypothesis can be confirmed by analyzing the data from Experiments 1 and Experiments 2 and Experiments 3 independently:

H2: Adding a description of organic attributes to one of the options can dramatically increase the negative emotions, even if the size of the choice set stays unchanged. H2a: Under identical experimental conditions, maximizers reported a higher increase in negative feelings than satisfiers.

H3: Including items in the choice set comparable to the first alternatives will significantly increase the negative emotions. H3a: Under identical experimental conditions, maximizers reported more pronounced emotional changes than satisficers.

H4: Consumers' choice overload and negative emotions can be lessened by giving positive information about low-fat attributes, while the size of the choice set and the number of attributes defining products stay the same. H4a: Unlike satisficers, maximizers are more likely to be impacted by the positive information about low-fat attributes, and the negative emotions expressed are noticeably less strong.

3.3.1Experiment 1

In the first experiment, participants selected between two liquid milk products: product A and product B, product A and product C. The same Product A was offered in both options. Participants will receive health information about organic characteristics after their first selection and completing the assessment scale. After reading and assessing the information's perceived validity and dependability, they decided on this experiment's second option. It is important to note that product C added an organic attribute in the second choice.

3.3.2Experiment 2

Subjects were again randomly assigned to three groups for Experiment 2. In the first choice, the same choice set, product and 2A, was presented to each participant in the three groups. However, in the second choice, the three groups had to choose between three brand-new experimental products (2B, 2B, and 2*) that were quite comparable to the first product (2A) in the choice set in terms of several attributes.

3.3.3Experiment 3

In the third experiment, participants were given twice the same selection of liquid milk products. Following their initial selection and completion of the choice overload scale, the participants were informed of the benefits and drawbacks of consuming fat for human health.

4 Data and Analysis

4.1 Data collection and Descriptive statistics

Data collection took place on September to November 2021, a total of 268 subjects were obtained. Participants are undergraduate students from Huazhong Agricultural University. Before the trial, each participant was randomly assigned to one of three experiments; each experiment had 135, 135, and 113 participants respectively. Table 1 provides descriptive statistics of participants. Most were female (73.8%) and aged between 18 and 26 (98.4%). 57.7% of the participants drank liquid milk at least once every two or three days.

Table 1. Summary statistics of survey samples

N=248	Frequency	%	N=248	Frequency	%
Gender			**Frequency of liquid milk consumption**		
Male	65	26.2	Seldom	69	27.8
Famale	183	73.8	Once a week	36	14.5
			every two or three days	88	35.5
			once a day	47	18.95
			Twice a day or more	8	3.2
Age groups			**Average monthly expenditure on liquid milk consumption(yuan)**		
<18	1	0.4	<20	51	20.6
18-20	187	75.4	20-30	44	17.7
21-23	32	12.9	30-50	66	26.6
24-26	25	10.1	50-100	61	24.6
>26	3	1.2	>100	26	10.5
The average monthly cost of food consumption(yuan)			**Liquid milk purchase way**		
<600	20	8.1	Large general supermarket	21	8.5
600-800	44	17.7	Educational supermarket	139	56.1
800-1000	93	37.5	Canteen internal counter	6	2.4
1000-1200	55	22.2	Online	80	32.3
>1200	36	14.5	Other ways	2	0.8

4.2 Validity, reliability test, and principal component analysis

The effects of the experimental manipulation on choice load, which is expressed in the subjects' subjective emotions, are measured by the differences of scale scores between two sequential choices in the same experimental setting. This study introduced a new subjective measurement scale of choice overload with 27 items, each measured by a 5-point scale (1 representing very inconsistent, five representing very consistent). Using principal component analysis, the measurement's dimension was reduced. With a KMO value of 0.938, it was clear that the questionnaire was appropriate for the PCA. After extracting six components, the cumulative variance contribution rate was 69.56%. The six elements were choice difficulty, degree of confusion, degree of pressure, anticipated regret, choice confidence, and decision satisfaction. The

scale's Cronbach's Alpha coefficient was 0.9300, demonstrating the scale's reliability, good internal consistency, and compliance with the standards of a reasonable and scientific experimental design. Table 2 displays the investigation findings of the subjective states factor loads and reliability.

Table 2. Subjective feedback factor loading and reliability statistics

Variable	Item	Item Loading	Cronbach's Alpha
Choice difficulty			0.915
	The various attributes of these products confused me.	0.370	
	The more I learned about products, the harder to make the choice.	0.422	
	It was hard for me to distinguish the product characteristics.	0.534	
	It was tough to compare the different products.	0.433	
Confusion degree	While making the decision, I felt uncertain	0.200	0.903
	I paid enough attention to the attributes of the products.	0.545	
	The choice process required an adequate comparison of the products	0.590	
	The choice process required a lot of concentration and deep thinking.	0.517	
Pressure degree			0.930
	The process of deciding which product to choose was frustrating.	0.348	
	It was hard for me to come to a decision.	0.214	
	I worried about making the wrong choice.	0.258	
	I tried to avoid making the decision.	0.274	
	I tried to put off making the decision.	0.332	
	I was anxious when I faced these options.	0.404	
	I wanted to refer to other people's choices.	0.190	
	I was stressed when I faced these options.	0.409	
Anticipated regret			0.901
	I was worried about getting important information after I chose a product.	0.468	
	I was curious about what would have happened if I had chosen differently.	0.590	
	I feared that I was overlooking better products.	0.548	
Choice confidence	I worried about making the wrong choice.	0.247	0.551
	Once I had made the decision, I stopped worrying about it.	0.661	
	After making the decision, I do not regret the decision.	0.634	
Decision satisfaction			0.867
	The process of deciding which product to choose is	0.349	

interesting.	
I am satisfied with my experience of deciding which product to choose.	0.428
I thought the choice I made was good.	0.458
While making the decision, I felt sure.	0.513
I stick to the choice I just made.	0.385

4.3 Consumer classification

Previous research indicated that consumer's personality is crucial in determining their decision-making styles. From prior research, it may be inferred that maximizers and satisficers—identified based on their pursuit of maximization—have distinct approaches to commodity search, comparison, and selection. Based on scales that categorizing consumers into maximizers and satisfiers (Sprotles and Kendall, 1986; Schwartz and Ward, 2002), to further distinguish maximizers and satisficers from consumption habits, decision-making style, information searching, and other aspects, more questions such as the purchasing attitude toward the preferred commodity/category/commodity, the ability to process commodity information, and the attitude toward the differentiation of commodity attributes, and choice strategies were added.

The questionnaire's structural validity was further tested using principal component analysis, extracting two factors—the maximizer factor and the satisficer factor, respectively. According to the K-mean cluster analysis, 182 maximizers accounted for 73.4% of the total participants, and 66 satisfiers accounted for 26.6%. The following are the two consumer categories' particular traits: Maximizers conduct thorough searches, which leads them to look for product diversification and invest a lot of time and effort in analyzing the characteristics of various commodities. However, because of their limited cognitive resources, individuals will find it challenging to make decisions because of the information overload caused by too many goods, which would make them feel uneasy and confused. Satisficers tend to use less cognitive effort and locate the "satisfaction" alternative rather than striving for the ideal solution. They conduct fewer searches for options and information because they rely more on heuristic decision-making techniques. Additionally, once consumers discover a product or store they enjoy, they will return for more purchases.

5 Results

To determine whether the manipulation produced statistically significant changes in the choice overload scale results and whether the types of consumers would influence these changes, the paired sample T-test method in the non-parametric test was utilized to compare the differences of subjective states reported by the subjects between the two choices before and after.

5.1 Experiment 1and 2 and Merging Data Analysis Results

The choice set's complexity was increased differently in experiments 1 and 2, allowing to investigate the impact of choice set complexity on choice overload and whether this effect varies in the characteristic of consumers.

There were 248 individuals in experiments 1 and 2, 186 were satisficers and 182 were maximizers. According to the results of the paired sample test shown in the table 3, subjects felt more pressured, more confused, and found it more challenging to decision when the choice set's complexity is increased, which confirms hypothesis 1. In addition, the maximizer were more pressured, more confused and reported it more difficulty to decision, while satisficers merely displayed an increase degree of confusion, this result supports hypothesis 1a.

According to the results in column five column six, when the choice set difficulty was added to a higher level, subjects would be more confused, more pressured, and find it more difficult to decision.

Table 3. The paired sample t-test results of the whole data

	Study 1&2 Merging data			**Study 1**	**Study 2**
	Full sample	Maximizers	Satisficers		
Choice difficulty	0.017**	0.019**	0.010	0.015	0.018*
	（0.009）	（0.010）	（0.022）	（0.013）	（0.013）
Confusion degree	0.037***	0.026**	0.066***	0.028**	0.047***
	（0.011）	（0.011）	（0.024）	（0.015）	（0.015）
Pressure degree	0.015**	0.019**	0.017	0.015*	0.016**
	（0.007）	（0.006）	（0.020）	（0.011）	（0.009）
Anticipated regret	-0.011	-0.010	-0.014	-0.004	-0.020
	（0.009）	（0.009）	（0.022）	（0.013）	（0.011）
Choice confidence	-0.002	0.004	-0.021	-0.004	0.000
	（0.009）	（0.010）	（0.023）	（0.013）	（0.014）
Decision satisfaction	-0.003	-0.005	0.003	0.000	-0.006
	（0.008）	（0.008）	（0.021）	（0.011）	（0.012）

Note: ***p < 0.01; **p < 0.05; *p < 0.1.
Numbers in parentheses are standard errors

5.2 Experiment 1 – Increasing the number of attributes

Experiment 1includes 135 subjects in total, 97 maximizers and 38 satisficers. Table 4 displays the results of paired-sample t-test. Regardless of consumer types, adding organic attribute to the liquid milk product made participants felt more pressured and confused, thus supports the hypothesis 2. Morever, maximizers were more confused and pressured than satisficers, while satisficers were more confident about their decision than maximizers, these findings alao fit hypothesis 2a.

Table 4. Paired sample T-test and three contingency tables in experiment 1

	Full sample	**Maximizers**	**Satisficers**

Choice difficulty	0.015 （0.013）	0.006 （0.007）	0.014 （0.019）
Confusion degree	0.028** （0.015）	0.013* （0.008）	0.023 （0.020）
Pressure degree	0.015* （0.011）	0.009** （0.005）	0.004 （0.018）
Anticipated regret	-0.004 （0.013）	-0.004 （0.006）	0.004 （0.020）
Choice confidence	-0.004 （0.013）	0.007 （0.006）	-0.027* （0.020）
Decision satisfaction	0.000 （0.011）	-0.002 （0.006）	0.006 （0.016）

Note: ***p < 0.01; **p < 0.05; *p < 0.1.
Numbers in parentheses are standard errors

5.3 Experiment 2 – Adding similar options to the choice set

In this experiment, 85 participants are maximizers and 28 are satisfiers. The results of the paired sample t-test are displayed in Table 5. In the full sample, participants reported more pressure, more confusion, more anticipated regret, and harder to decision when a similar choice was added to the choice set, which is consistent with hypothesis 3. It is also indicated that maximizers had greater levels of confusion and found it more challenging to decision. In contrast to experiment 1, once a similar option was added, satisfiers also felt more pressured and more confused. These findings contradict hypothesis H3a. It is important to note that, regardless of consumer type, participants reported less anticipated regret than before (this change is not statistically significant for maximizers).

Table 5. Paired sample T test result in experiment 2

	Full sample	**Maximizers**	**Satisficers**
Choice difficulty	0.018* （0.013）	0.013** （0.007）	-0.004 （0.012）
Confusion degree	0.047*** （0.0150）	0.013** （0.008）	0.043*** （0.015）
Pressure degree	0.016** （0.009）	0.005 （0.004）	0.013* （0.009）
Anticipated regret	-0.020** （0.011）	-0.006 （0.006）	-0.018** （0.009）
Choice confidence	0.000 （0.014）	-0.002 （0.007）	0.006 （0.012）
Decision satisfaction	-0.006 （0.012）	-0.003 （0.006）	-0.003 （0.013）

Note: ***p < 0.01; **p < 0.05; *p < 0.1.
Numbers in parentheses are standard errors

5.4 Experiment 3 – Providing positive information about attributes

Experiment 3 involved 135 participants; 97 were maximizers, and 38 were satisfiers. The results of paired sample t-test are shown in Table 6, which demonstrated that when receiving good information on the low-fat attributes, consumers felt less pressured, less confused, less difficult to make decisions, and less likely to regret. Additionally, they reported a significant improvement in choice satisfaction. These findings support hypothesis 4. Considering consumer characteristics, it is shown that after an information nudge, both maximizers and satisficers felt less confused and found it less difficult to make decisions. Furthermore, maximizers reported lower pressure, lower anticipated regret, and higher satisfaction, which verifies the hypothesis 4a.

Table 6. Paired sample T test result in experiment 3

	Full sample	**Maximizers**	**Satisficers**
Choice difficulty	-0.047***	-0.037***	-0.073**
	（0.013）	（0.013）	（0.035）
Confusion degree	-0.031**	-0.024*	-0.050*
	（0.015）	（0.015）	（0.036）
Pressure degree	-0.018**	-0.017*	-0.022
	（0.011）	（0.011）	（0.027）
Anticipated regret	-0.027**	-0.026**	-0.031
	（0.012）	（0.012）	（0.028）
Choice confidence	0.010	0.006	0.018
	（0.012）	（0.014）	（0.026）
Decision satisfaction	0.026**	0.026**	0.029
	（0.011）	（0.012）	（0.027）

Note: ***p < 0.01; **p < 0.05; *p < 0.1.
Numbers in parentheses are standard errors

6 Conclusion

This study modified scales used to quantify choice overload by applying the memory utility approach and incorporating the subjective state consequence of choice overload into the experienced utility framework. The results showed that increasing the number of attributes and adding similar options would result higher choice overload, resulting in more negative emotions, because complex decisions, which raise consumer’s anxiety and psychological stress, require more comparisons and trade-offs (Iyengar and Lepper, 2001; Marck, 2010). Besides, an information nudge can reduce consumers’ negative emotions, increase their decision satisfaction, and lower choice overload.

In accordance with Saltsman's (2021) and Schwartz's (2002) findings, our results show that

choice overload experienced by consumers is heterogeneous. When choice tasks getting more complex, maximizers are more likely than satisficers to be driven to negative emotions; nonetheless, these negative emotions would be reduced to a greater extent when positive information was offered. Since maximizers' inclination to over-compare and chase better (Sparks et al., 2012), extensive search and comparison lead them to experience a significant cognitive burden. In contrast, satisficers aim to obtain more satisfaction, which promotes their positive emotions in decision-making (Roese, 1994; Sweeny and Vohs, 2012; Kamiya et al., 2021).

This work furthers our understanding of how to modify choice complexity by showing that adding additional attributes while the choice set stays small can also change the choice set complexity and affect the choice load. As our experiments were based on hypothetic choices, and consumers were provided with visual products, future research might investigate the effect of choice overload in real-world consuming environments.

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