



Feeling and Calculation: The Impact of Lay Rationalism Thinking Mode on Mental Budgeting

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Abstract

Mental budgeting is a cognitive process that helps individuals control consumption expenditures. Previous literature has shown that mental budgeting is influenced by people's cognitive capabilities and emotions, which indicates a potential influence of thinking modes on mental budgeting. Under the view of lay rationalism, the present three studies investigated the relationship between thinking modes (i.e., calculation-based thinking and feeling-based thinking) and mental budgeting, as well as the moderating effect of product types that participants consume. It was found that, first, the scores of lay rationalism, which indicate calculation-based thinking, were positively correlated with the mental budgeting levels of college students (Study 1a) and newcomers in the workplace (Study 1b); second, the activation of calculation-based thinking (vs. feeling-based thinking) decreased participants' consumption willingness (Study 2); and third, the calculation-based thinking exhibited a stronger binding effect in participants who consumed only hedonic products than in participants who consumed only utilitarian products (Study 2). The results demonstrated the effects of lay rationalism thinking mode and product types on mental budgeting, which highlighted different implications for consumers and merchants.

Keywords Mental budgeting · Thinking mode · Product type · Lay rationalism

Introduction

With advancements in technology, people's economic lives have become increasingly rich and complex. As a result, diversified goods have brought greater challenges to people's financial management while facilitating people's shopping and consumption. For instance, younger groups of people often experience an imbalance in income and expenditure. Exuberant consumer demand and limited income and savings make young people often suffer from overspending and insolvency. Therefore, it is important to investigate ways to encourage reasonable consumption within an

individual's economic limitations. Moreover, because the pandemic of COVID-19 (Mitchell & Zumbun, 2020) and the turbulent international situation have dragged down the world's economy in the recent years, investigating influencing factors and mechanisms of rational consumptions becomes particularly important. Mental budgeting, which refers to the separating of resources to mental accounts and the tracking of expenses against the budgets, is such a self-control mechanism (Antonides et al., 2011; Galperti, 2019; Heath & Soll, 1996).

Mental budgeting helps individuals consume reasonably through the processes of budget setting and expense tracking. This would be conceptualized as a binding effect of mental budgeting. It was revealed that the binding effect of mental budgeting may be influenced by several factors. For example, Antonides et al. (2011) found that mental budgeting was negatively correlated with participants' education level, net household income, savings, short-term orientation, etc. There was also evidence that the temporal frames and ambiguity of budgets and the payment mechanisms influenced mental budgeting (Cheema & Soman, 2006; Soman, 2001; Soman & Lam, 2002; Ülkümen et al., 2008). Although several influencing factors of mental budgeting

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have been revealed (Antonides et al., 2011; Homburg et al., 2010; Liu & Chou, 2016), the literature has facilitated further research questions. In particular, what is the mechanism of the binding effect of mental budgeting? The current study suggested that the thinking mode (i.e., calculation-based thinking and feeling-based thinking) is a candidate.

Mental budgeting and thinking mode

In general, mental budgeting is viewed as a part of mental accounting that refers to the psychological separation, recording, and summary of economic categories (Antonides et al., 2011; Cheema & Soman, 2006; Huang et al., 2018; Kivetz, 1999; Thaler, 1985, 1999). Specifically, mental budgeting reflects how consumers separate their total resources into different mental accounts (the process of budgets setting) and keep track of their expenses against the corresponding budgets (the process of expenses tracking) (Heath & Soll, 1996). It was revealed that individuals with mental budgets would limit their consumption in the corresponding category (Antonides et al., 2011; Heath & Soll, 1996). For example, Krishnamurthy and Prokopec (2010) found that participants with an estimation of the intake extent of calories (a form of mental budgets) selected fewer desserts than those without such an estimation. Therefore, mental budgeting is viewed as a valid way of self-control, especially for those with limited income and savings (Cheema & Soman, 2006; Liberman et al., 2002; Soman, 2001). However, the binding effect of mental budgeting on consumption may be influenced by several factors, such as an individual's education level, short-term orientation, offers of discounts and payment mechanisms (Antonides et al., 2011; Cheema & Soman, 2006; Elgeka & Ma, 2020; Heath & Soll, 1996; Soman, 2001; Soman & Lam, 2002; Ülkümen et al., 2008).

The dual-process model suggests that individuals have two distinct cognitive systems, one deliberate and calculation-based and the other associative and feeling-based (Chaiken & Trope, 1999; Hsee & Rottenstreich, 2004; Kahneman & Frederick, 2002; Palmatier & Crecelius, 2019; Pham et al., 2015). Accordingly, the binding effect of mental budgeting may be interpreted in two different ways. On the one hand, mental budgeting could be viewed as a deliberate cognitive process that may be hindered by factors that hamper the expenses calculating and tracking. For example, Krishnamurthy and Prokopec (2010) found that participants consumed more desserts when the unit of mental budgets (i.e., calories) was incompatible with that of expenses (i.e., fat grams). Under the view of calculation-based thinking, it was interpreted that incompatibility increased the difficulty of calculating and comparing current consumptions and mental budgets and thus impeded the effect of mental budgets. On the other hand, mental budgeting could be

viewed as an associative cognitive process that is susceptible to emotions and feelings in consumption. For example, Soman (2001) found that participants who paid by credit card exhibited higher purchase intentions in the current consumption than those who paid by cash or check. Under the view of feeling-based thinking, the results were interpreted to indicate that participants who paid by credit card experienced lower levels of pain and hence exhibited lower levels of self-control in future spending (see also Rick et al., 2008). Indeed, there was evidence that paying money instead of credit cards would activate affective pain-processing in brain areas and thus decrease the willingness to pay in cash (Mazar et al., 2017).

Based on the dual-process model (Chaiken & Trope, 1999; Kahneman & Frederick, 2002), Hsee and Rottenstreich (2004) distinguished two thinking modes that individuals assess the value of a specific target: valuation by calculation and by feeling. They found that when calculation-based thinking was activated, participants were more sensitive to the quantitative changes in targets (e.g., the number of pandas in need of help), and their behaviors were closer to linear functions of the scope. The results were also supported by Pham et al. (2015). Later, Hsee and colleagues developed a lay rationalism scale (abbreviated as the LR Scale) to examine the extent to which individuals are calculation-based or feeling-based in decision-making (Hsee et al., 2015). In the scale, lay rationalism was viewed as a continuum with two endpoints: feeling-based thinking and calculation-based thinking. It was found that the LR Scale had good reliability and validity, and participants with higher LR scores (i.e., higher levels of calculation-based thinking) were more likely to buy utilitarian goods rather than hedonic goods, to save money rather than spend it, and were less likely to donate to charity or others (Hsee et al., 2015). These results and other previous findings have indicated that individuals with higher LR scores show less financial decision avoidance (Park & Sela, 2018) and higher level of preciseness in price presentation, such as being able to distinguish the difference between precise and rounded price information (Cui et al., 2021), and they are more likely to exhibit self-control behaviors in consumption (Hsee et al., 2015). Thus, it is reasonable to suggest that consumers with higher levels of calculation-based thinking were more likely to calculate and keep track of their consumption.

To conclude, both the literature of mental budgeting and the literature of lay rationalism suggested an effect of thinking modes (i.e., calculation-based thinking and feeling-based thinking) on mental budgeting. That is, consumers with higher levels of calculation-based thinking (vs. feeling-based thinking) were more (vs. less) likely to use mental budgeting to control their consumption. However, no research has explicitly and directly examined the

relationships between thinking modes and mental budgeting. The current research adopts the viewpoint of Hsee et al. (2015) and hypothesizes that calculation-based thinking would strengthen the binding effect of mental budgeting. In other words, feeling-based thinking would do the opposite.

Mental budgeting and product type

Mental budgeting consists of two processes: budget setting and expense tracking (Heath & Soll, 1996). In the budget setting process, individuals divide their resources into different categories, such as food, clothing, and entertainment (Cheema & Soman, 2006; Heath & Soll, 1996). Then, individuals have the opportunity to track and control their expenses in each category. Although the budget setting process is the basis and precondition of expense tracking, previous literature paid more attention to the process of expense tracking (e.g., Antonides et al., 2011; Heath & Soll, 1996). In other words, the budget categories were assumed to be the contexts of mental budgeting, and thus, the self-control mechanism of mental budgeting was indeed category-free. However, this is not the case. For example, Cheema and Soman (2006) found that participants flexibly classified an attractive and ambiguous expense (i.e., eat dinner with a friend) into categories with surplus. In particular, if participants expected that some future expenses were hard to categorize, they would allocate fewer expenses to a specific category now. By doing so, expected future expenses can be categorized within the limitation of mental accounting. Sussman et al. (2015) found that in situations where charitable donations were perceived to have a weak relationship to an individual's budget, participants made larger donations. That is, the budget categories were important factors of mental budgeting.

To investigate the self-control mechanism of mental budgeting, previous literature frequently provides participants with recent expenses in several categories such as food, clothing, and entertainment (Cheema & Soman, 2006; Heath & Soll, 1996). This procedure has several advantages. On the one hand, the manipulation is compatible with an individual's real consumption during a specific period (e.g., a month or a week). On the other hand, the manipulation provides researchers the opportunity to investigate the pure effect of mental budgeting by balancing consumption in different product categories. However, individuals' consumption decisions are influenced not only by the aggregate consumption and budgets in a specific period but also by the characteristics of the just completed consumption. For example, the guilt-reduction proposition suggested that individuals would experience higher levels of guilt in the consumption of hedonic products than in the consumption of utilitarian products, which may hinder their future

consumption of hedonic products (Strahilevitz & Myers, 1998). If individuals have the opportunities either to reduce the feelings of guilt or to justify their consumption, they will consume more hedonic products (Khan & Dhar, 2006; Kivetz & Simonson, 2002). Therefore, it is reasonable to propose that the product type that individuals consume would affect their subsequent consumption behaviors.

The literature on calculation-based and feeling-based thinking modes also indicates the effect of product type on mental budgeting. Many studies classify products into hedonic and utilitarian categories (e.g., Dhar & Wertenbroch 2000; Khan & Dhar, 2006; Kivetz & Simonson, 2002; Rathee et al., 2022). There was evidence that individuals with higher levels of calculation-based thinking were more likely to delay gratification and buy utilitarian goods (i.e., a power outlet) or goods that are compatible with long-term objects, whereas participants with higher levels of feeling-based thinking were more likely to seize the day and buy hedonic goods (i.e., an entertainment magazine) (Hsee et al., 2015; Metcalfe & Mischel, 1999). According to Hsee et al.'s (2015) view, "feelings are inherently hedonic"; thus, consumers with higher levels of feeling-based thinking value hedonic products more than those with higher levels of calculation-based thinking. That is, individuals who are consuming hedonic products are more likely to engage in higher levels of feeling-based thinking than individuals who are consuming utilitarian products. Therefore, it is reasonable to propose that the activation of calculation-based thinking would decrease the willingness to consume hedonic products. To conclude, the effect of thinking mode on the binding effect of mental budgeting is moderated by the product type that participants consumed.

The current research

The present research investigated the effect of lay rationalism thinking mode (i.e., calculation-based thinking and feeling-based thinking) on mental budgeting, as well as the moderating role of product type that participants just consumed. Because college students and newcomers in the workplace have limited income as well as usually are incapable of planning their budgets, or fail to track their expenses (Elgeka & Ma, 2020), they frequently experience financial difficulties and imbalance between income and expenditure. Therefore, this research would choose them as samples. First, both college students (Study 1a) and newcomers in the workplace (Study 1b) were measured by the LR Scale (Hsee et al., 2015) and a mental budgeting scale (Antonides et al., 2011), and the correlation between lay rationalism thinking mode and mental budgeting was examined. Study 2 conducted a 2 (thinking mode: calculation-based vs. feeling-based thinking modes) \times 2 (product

type: hedonic products vs. utilitarian products) experiment. Study 2 first primed participants' thinking mode and then examined its impact on psychological budget constraints after purchasing hedonic or practical goods in a simulated consumption task. These three studies aimed to examine the effect of calculation-based thinking on mental budgeting, and the moderating effect of product type. By doing so, the present research may contribute to the current literature in terms of identifying the influencing factors and interpreting the mechanisms of mental budgeting. Moreover, the research may provide useful guidance for young people's rational consumption and financial education design.

Study 1: the association between thinking mode and mental budgeting

Study 1 measured the lay rationalism thinking mode and mental budgeting of college students (Study 1a) and newcomers in the workplace (Study 1b) respectively. On the one hand, the two studies examined the relationship between thinking mode and mental budgeting. On the other hand, the two studies examined the individual differences in these variables either within each subgroup or between the subgroups.

Study 1a: the thinking mode and mental budgeting of college students

Participants and measures

Participants. One hundred forty-five college students in Beijing participated in the measurement, and 138 participants responded successfully. To eliminate the influences of budgeting expertise, data from six participants who majored in finance and accountancy were excluded from the data analysis. Thus, Study 1a contained 132 participants (57 males and 75 females). Their mean age was 23.80 years, $SD=2.23$. Among them, 37 participants had a monthly disposable account of less than 1,500 RMB (about 215 dollars), 43 participants had a monthly disposable account that ranged from 1,501 to 2,000 RMB (about 285 dollars), 26 participants had an account that ranged from 2,001 to 2,500 RMB (about 357 dollars), and 26 participants had an account of more than 2,500 RMB.

Thinking mode. The LR Scale developed by Hsee et al. (2015) was conducted to measure participants' thinking mode. Participants had to evaluate their attitudes on 6 items such as "When making decisions, I like to analyze financial costs and benefits and resist the influence of my feelings" on a scale from 1 (strongly disagree) to 6 (strongly agree). Items 2 and 5 were reversely scored. The average score of

Table 1 The descriptive statistics of college students' thinking mode and mental budgeting

	<i>n</i>	Thinking mode		Mental budgeting	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Gender					
Male	57	3.95	0.82	3.45	0.78
Female	75	3.76	0.69	3.55	0.75
Monthly disposable account					
Less than 1,500 RMB	37	3.90	0.65	3.68	0.63
1,501–2,000 RMB	43	3.83	0.74	3.60	0.75
2,001–2,500 RMB	26	3.87	0.66	3.34	0.77
More than 2,500 RMB	26	3.77	0.99	3.27	0.88

the scale indicates the participant's lay rationalism thinking mode. A higher score indicates that the participant is more likely to think based on calculation (i.e., calculation-based thinking), and a lower score indicates that the participant is more likely to think based on feeling (i.e., feeling-based thinking). In this study, the Cronbach's α of the scale was 0.63.

Mental budgeting. A mental budgeting scale developed by Antonides et al. (2011) was used to measure the participants' levels of mental budgeting. This scale contains 4 items that capture the ideas of mental separation of expenses, budget setting for each category of expenses, economizing after spending, and economizing in the next month. Participants have to evaluate their attitudes from 1 (strongly disagree) to 5 (strongly agree). A higher average score of the 4 items indicates a stronger binding effect of mental budgeting in an individual's consumption (Habibah et al., 2018). In this study, the Cronbach's α of the scale was 0.65.

Results and discussion

To examine the common method variance effect of the self-reported measurement, a Harman's single-factor test was conducted (Aulakh & Gencturk, 2000). The exploratory factor analysis on the items of the two scales exhibited 4 factors with an eigenvalue greater than 1, and the variance interpretation ratio of the first factor was 28.58%, lower than the suggested standard of 40%. Therefore, this study did not have serious common method biases.

The mean scores of lay rationalism thinking mode and mental budgeting were 3.84 ($SD=0.75$) and 3.51 ($SD=0.75$), respectively. Neither gender difference in thinking mode ($t(130)=1.43, p=.16$) nor in mental budgeting ($t(130)=-0.71, p=.48$) was found. Moreover, there was no difference among participants with different monthly disposable accounts (thinking mode: $F(3, 128)=0.16, p=.92$; mental budgeting: $F(3, 128)=2.21, p=.09$). The descriptions are depicted in Table 1.

Table 2 The regression analysis of the data of college students

	Model 1		Model 2		
	β	<i>t</i>	β	<i>t</i>	
Monthly disposable account					
Dummy variable 1	-0.05	-0.50	-0.04	-0.40	
Dummy variable 2	-0.18	-1.80	-0.18	-1.83	
Dummy variable 3	-0.22	-2.16*	-0.20	-2.04*	
Thinking mode			0.27	3.17**	
R^2					0.12
<i>F</i>					4.29**
ΔR^2					0.07
ΔF					10.06**

Note: * indicates $p < .05$; ** indicates $p < .01$

The correlation analysis showed that the score of college students' mental budgeting was significantly correlated with that of thinking mode ($r = .27, p < .01$) and monthly disposable account ($r = -.22, p < .05$). The results indicated that college students with higher levels of calculation-based thinking were more likely to exhibit a binding effect of mental budgeting. A regression analysis was further conducted. Because participants' monthly disposable accounts were significantly correlated with their mental budgeting, the former variable was designed into three dummy variables (coded as 1, 2, and 3) and controlled in the analysis. In the analysis, the group of participants with monthly disposable account less than 1,500 RMB was designed as the reference. In dummy variable 1, the group of monthly disposable account between 1,501 and 2,000 RMB was coded as 1 and the other groups were coded as 0. In dummy variable 2, the group of monthly disposable account between 2,001 and 2,500 RMB was coded as 1, and the other groups were coded as 0. In dummy variable 3, the group of monthly disposable account more than 2,500 RMB was coded as 1, and the other groups were coded as 0. The analysis showed that the lay rationalism thinking mode was a significant predictor of mental budgeting ($\beta = 0.27, p < .01$) (see Table 2).

The results supported our hypothesis that calculation-based thinking was positively correlated with mental budgeting. However, this study found neither gender differences nor monthly disposable account differences in the two variables, which was inconsistent with previous literature that found that male citizens had lower levels of mental budgeting (Antonides et al., 2011) and higher levels of calculation-based thinking than females (Hsee et al., 2015). The inconsistency may derive from the different samples. To strengthen the ecological validity of Study 1a, Study 1b therefore repeated the research procedure of Study 1a in a new sample, that is, newcomers in the workplace.

Newcomers in this study refer to those employees who have worked for less than three years. In contrast to employees with longer service time, newcomers are more similar in age to college students and are more likely to have limited

income and fall into an imbalance in income and expenditure. In our opinion, investigating their thinking mode and mental budgeting would provide stronger comparable evidence to Study 1a. Moreover, investigating the current question is more valuable to low-income individuals than to high-income counterparts. Therefore, Study 1b conducted the same procedure in newcomers in the workplace.

Study 1b: the thinking mode and mental budgeting of newcomers in the workplace

Participants and measures

Participants. Two hundred eighty-five newcomers in the workplace participated in the measurement and 255 participants responded successfully. Data from 43 participants who worked in finance or accountancy positions and those who worked more than three years were excluded from the data analysis. Thus, Study 1b contained 212 participants (95 males and 117 females). Their mean age was 24.14 years, $SD = 1.85$. Among them, 28 participants had a monthly income less than 3,000 RMB (about 430 dollars), 90 participants ranged from 3,001 to 6,000 RMB (about 860 dollars), 63 participants ranged from 6,001 to 9,000 RMB (about 1,290 dollars), and 31 participants had a monthly income more than 9,000 RMB. For participants' education level, 157 participants completed their college education, 26 completed lower-than-college education, and 29 completed post-graduated education.

Measures. The two variables of thinking mode and mental budgeting were measured by the same instruments in Study 1a. In Study 1b, the Cronbach's α of the LR scale and the mental budgeting scale were 0.68 and 0.64, respectively.

Table 3 The descriptive statistics of the thinking modes and mental budgeting of newcomers in the workplace

	<i>n</i>	Thinking mode		Mental budgeting	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Gender					
Male	95	4.28	0.69	3.81	0.64
Female	117	4.00	0.77	3.48	0.66
Monthly income					
Less than 3,000 RMB	28	4.02	0.91	3.45	0.70
3,001–6,000 RMB	90	4.14	0.74	3.81	0.61
6,001–9,000 RMB	63	4.13	0.68	3.63	0.57
More than 9,000 RMB	31	4.13	0.74	3.27	0.83
Educational level					
Lower-than-college	26	4.21	0.81	3.72	0.73
College	157	4.13	0.77	3.66	0.63
Post-graduated	29	4.03	0.54	3.41	0.80

Results

A Harman's single-factor test was also conducted to test the common method variance effect (Aulakh & Gencturk, 2000). The exploratory factor analysis exhibited 3 factors with an eigenvalue greater than 1 and the variance interpretation ratio of the first factor was 29.93%, lower than the suggested standard of 40%. Therefore, this study did not have serious common method biases.

The mean scores of lay rationalism thinking mode and mental budgeting were 4.12 ($SD=0.74$) and 3.63 ($SD=0.67$) respectively. Further analysis showed significant gender differences in thinking mode ($t(210)=1.43, p<.01, Cohen's d=0.38$) and in mental budgeting ($t(210)=3.70, p<.01, Cohen's d=0.51$). As depicted in Table 3, males exhibited higher levels of calculation-based thinking and mental budgeting than females. The analysis also showed significant differences in mental budgeting among participants with different monthly incomes ($F(3, 208)=6.33, p<.01, \eta^2_p=0.08$), and the mental budgeting levels of participants with monthly incomes less than 3000 RMB or more than

9000 RMB were lower than those of the other two groups. There was no significant difference in thinking mode among participants with different monthly incomes ($F(3, 208)=0.19, p=.90$). Neither the score of lay rationalism thinking mode ($F(2, 209)=0.36, p=.70$) nor mental budgeting ($F(2, 209)=2.02, p=.14$) was varied by participants' education level.

The correlation analysis showed that participants' scores of mental budgeting were significantly correlated with their thinking mode ($r=.35, p<.01$). The result indicates that newcomers in the workplace with higher levels of calculation-based thinking (vs. feeling-based thinking) were more (vs. less) likely to exhibit a binding effect of mental budgeting, which was consistent with that of Study 1a. In the further regression analysis, the gender and monthly incomes of participants were controlled. The monthly incomes were also designed into three dummy variables. In the analysis, the group of participants with monthly incomes less than 3,000 RMB was designed as the reference. In dummy variable 1, the group of monthly incomes between 3,001 and 6,000 RMB was coded as 1, and the other groups were coded as 0. In dummy variable 2, the group of monthly incomes between 6,001 and 9,000 RMB was coded as 1, and the other groups were coded as 0. In dummy variable 3, the group with monthly incomes greater than 9,000 RMB was coded as 1, and the other groups were coded as 0. The analysis showed that thinking mode was a significant predictor of mental budgeting ($\beta=0.30, p<.001$) (see Table 4).

The results supported our hypothesis again that calculation-based thinking was positively correlated with mental budgeting. Inconsistent with the results of Study 1a, this study found both gender differences and monthly income differences in the two variables. Therefore, further analysis was conducted to explore the differences between the two samples.

We first compared the levels of thinking mode and mental budgeting of the two samples. The results of independent t tests showed that college students exhibited lower scores

Table 4 The regression analysis of the data of newcomers in the workplace

	Model 1		Model 2	
	β	t	β	t
Gender	-0.29	-4.50***	-0.23	-3.73***
Monthly income				
Dummy variable 1	0.30	2.99**	0.27	2.83**
Dummy variable 2	0.15	1.54	0.12	1.36
Dummy variable 3	-0.11	-1.31	-0.12	-1.52
Thinking mode			0.30	4.79***
R^2		0.17		0.25
F		10.26***		13.67***
ΔR^2				0.08
ΔF				22.94***

Note: ** indicates $p<.01$; *** indicates $p<.001$

on the LR Scale ($M=3.84$, $SD=0.75$) than newcomers in the workplace ($M=4.12$, $SD=0.74$), $t(343)=3.37$, $p<.01$, *Cohen's d*=0.38. That is, in contrast to college students, newcomers in the workplace were more likely to think on the basis of calculation. There was no significant difference between the mental budgeting levels of college students ($M=3.51$, $SD=0.76$) and newcomers in the workplace ($M=3.63$, $SD=0.67$), $t(342)=1.59$, $p=.11$.

To investigate whether the relationship between thinking mode and mental budgeting was moderated by sample type (college students vs. newcomers in the workplace), a bootstrap estimation based on the SPSS macro PROCESS program designed by Hayes (2013) was used. It was found that the scores of thinking mode (i.e., calculation-based thinking) predicted the levels of mental budgeting positively ($\beta=0.21$, $SE=0.06$, $t=3.52$, 95% CI = [0.09, 0.32]), and there was no significant moderating effect of sample type ($\beta=0.04$, $SE=0.08$, $t=0.57$, 95% CI = [-0.11, 0.19]). That is, the relationship between lay rationalism thinking mode and mental budgeting is stable across groups.

Discussion

There were differences between the results of demographic characteristics in Studies 1a and 1b. Study 1b revealed that male newcomers in the workplace exhibited higher levels of calculation-based thinking and mental budgeting than females, and the participants with monthly incomes less than 3,000 RMB or more than 9,000 RMB exhibited lower levels of mental budgeting than the others. A previous study found similar results: participants who had higher levels of household income exhibited lower levels of mental budgeting (Antonides et al., 2011). However, Study 1a did not find such differences in college students. As discussed in Study 1a, the work experience differences between the two samples may be an underlying interpretation. Indeed, the results also showed that newcomers in the workplace exhibited higher levels of calculation-based thinking and mental budgeting (but did not reach a statistically significant level) than college students, and gender and monthly income exhibited significant effects on mental budgeting in newcomers in the workplace rather than in college students (as depicted in Tables 2 and 4). In short, newcomers in the workplace were a more heterogeneous group than college students, and showed more differences in thinking mode and mental budgeting among different subgroups of gender or monthly income. Future studies may continue to investigate what factors in work experience and how do these factors affect thinking mode and mental budgeting. Moreover, although previous literature suggested that educational level would be an influencing factor of participants' mental

budgeting (Antonides et al., 2011), Study 1b did not support this suggestion.

Despite the above differences in the results of Studies 1a and 1b, both supported a stable relationship between lay rationalism thinking mode and mental budgeting. Specifically, participants with higher levels of calculation-based thinking exhibited higher levels of mental budgeting. The results were consistent with our hypothesis that thinking mode played an important role in mental budgeting. However, it is still unclear whether the results of Studies 1a and 1b indicate a causal effect. That is, engaging in a specific thinking mode would affect the extent to which individuals adopt a mental budget. To examine the causal effect of thinking mode on mental budgeting, Study 2 first activated participants' thinking mode and then measured their mental budgeting. As mentioned in the Introduction, Study 2 also examined the moderating effect of product type.

Study 2: the impacts of thinking mode and product type on mental budgeting

To examine the impacts of thinking mode and product type on mental budgeting, the participants' thinking mode (i.e., calculation-based thinking vs. feeling-based thinking) and product type that participants just consumed (i.e., hedonic products vs. utilitarian products) were manipulated, and then the mental budgeting levels were measured. An ANOVA was conducted to test the effect of thinking mode on mental budgeting and the moderating effect of product type.

Methods

Participants

To improve the ecological validity of the study, 140 youth passengers in the railway stations of Beijing and South Beijing were recruited. As conducted in Study 1, those who worked in or majored in finance and accountancy were excluded from the data analysis. Study 2 ultimately contained 129 participants (52 males and 77 females). Their mean age was 27.09 years, $SD=3.39$. The participants' monthly incomes were divided into four categories: less than 3,000 Yuan (RMB) (about 430 dollars) ($n=5$), 3,001 to 6,000 Yuan (RMB) (about 860 dollars) ($n=53$), 6,001 to 9,000 Yuan (RMB) (about 1,290 dollars) ($n=50$), and more than 9,000 Yuan (RMB) ($n=21$). For participants' education level, 109 participants completed their college education, 10 completed lower-than-college education, and 10 completed post-graduated education.

Table 5 The review of the expenses during the past 6 weeks

Weeks	Expenses (RMB)
First week	194.37
Second week	195.51
Third week	203.65
Fourth week	197.15
Fifth week	202.74
Sixth week	198.48

Materials and procedure

This study employed a 2 (thinking mode: calculation-based thinking vs. feeling-based thinking) \times 2 (product type: hedonic vs. utilitarian) between-subjects design. First, participants' thinking mode (either calculation-based or feeling-based) was activated by five questions; second, the product type was manipulated by showing participants 6 goods they just bought (either hedonic or utilitarian); finally, the mental budgeting was measured by a simulated consumption task.

Thinking mode. Thinking mode was manipulated by the procedure of Hsee et al. (2004). In the calculation-based thinking condition, participants were asked to answer five questions that required deliberate calculations, such as "If an object travels at five feet per minute, then by your calculations how many feet will it travel in 360 seconds". In the feeling-based thinking condition, participants were asked to examine and report their feelings in five questions such as "When you hear the word 'baby', what do you feel? Please use one word to describe your predominant feeling". The procedure would activate participants' calculation-based thinking and feeling-based thinking respectively.

Product type. The product type was manipulated by showing participants 6 goods they just bought (either hedonic or utilitarian) in an imaginary scenario. A prior study was conducted to determine the materials. First, 10 college students (5 females) were interviewed and then 14 hedonic goods and 14 utilitarian goods were selected; second, 30 college students were asked to list 7 most typical hedonic goods and 7 most typical utilitarian goods from the 14 alternative ones of each type; finally, the most frequently listed 6 hedonic goods and 6 utilitarian goods were selected to manipulate the product type. The manipulation of product type was embedded in the measurement of mental budgeting (see the following introduction of "mental budgeting").

Mental budgeting. Mental budgeting in Study 2 was measured by a simulated consumption task. According to previous literature (Cheema & Soman, 2006; Soman, 2001), mental budgeting refers to the self-control of expenses on the basis of one's budgets. To measure mental budgeting, participants were showed a review of their consumption during the past 6 weeks (see Table 5). As depicted in Table 5, the aggregate amount of expenses for life necessities in

each week was about 200 Yuan (RMB) (about 30 dollars) (excluding large expenditure such as weekly rent, valuable merchandises and so on). This procedure would help the participants set a weekly budget of 200 Yuan (RMB).

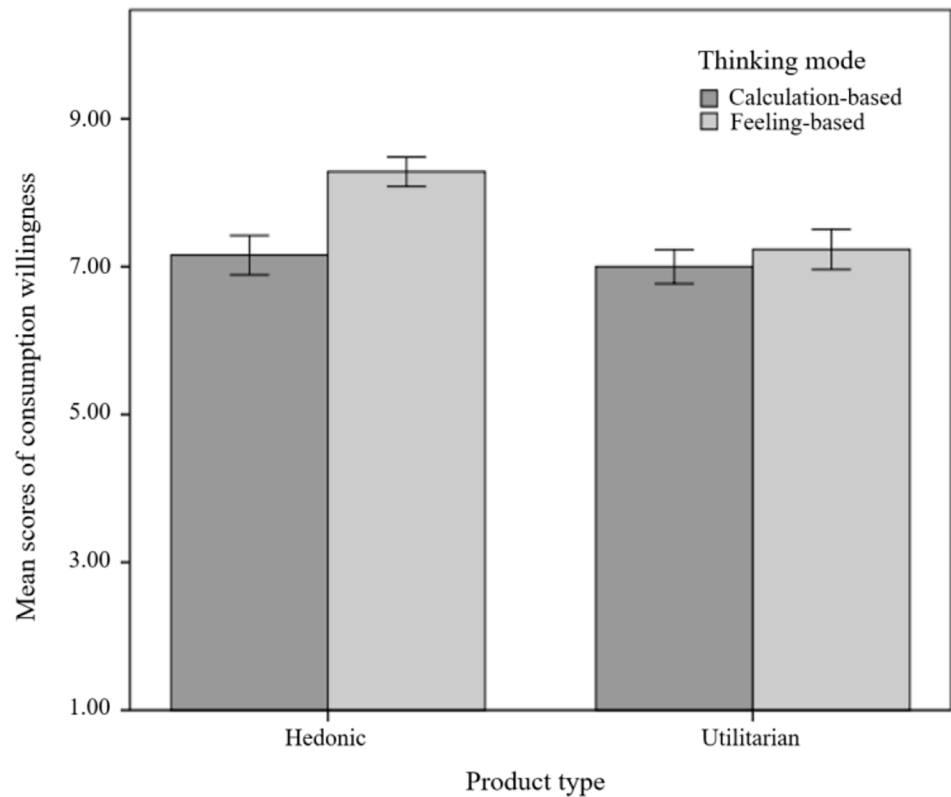
Then, participants were asked to imagine that they are shopping in a supermarket and that they have bought 6 goods. Next, they were asked to view the information of the goods they bought, including the items, graphs, and prices (see the supplementary materials and Hsee et al., 2004). In this step, participants were assigned to hedonic or utilitarian conditions by the product type they bought. Specifically, 6 goods that participants bought in the hedonic condition (e.g., Bluetooth stereo, entertainment magazine, aromatherapy, plush doll, beverage, and potato chips) were typically hedonic, while 6 goods that participants bought in the utilitarian condition (e.g., toilet tissue, power outlet, laundry detergent, tooth brush, towel, and cooking oil) were typically utilitarian. The aggregate expenses in both conditions were 195 Yuan (RMB), which were close to the weekly budgets of 200 Yuan (RMB). After then, participants were required to imagine that "After buying the 6 goods, you find a well-known company is promoting its new yogurt and it is your taste. The price of the yogurt is 36 Yuan (RMB) (about 5 dollars). Are you willing to buy it?" Participants had to evaluate their willingness from 1 (strongly do not want to buy it) to 10 (strongly want to buy it). A higher score of consumption willingness indicates a lower level of self-control of mental budgeting (Soman & Lam, 2002).

Results and discussion

A 2 (thinking mode: calculation-based thinking vs. feeling-based thinking) \times 2 (product type: hedonic vs. utilitarian) ANOVA was conducted to test the effects of thinking mode and product type on consumption willingness. The results showed a significant main effect of thinking mode: Participants in the calculation-based thinking condition had lower consumption willingness ($M=7.08$, $SD=1.40$) than those in the feeling-based thinking condition ($M=7.80$, $SD=1.42$), $F(1, 126)=8.40$, $p<.01$, $\eta^2_p=0.06$. When participants' gender, income, and education level were included as covariables, the main effect of thinking mode did not change ($F(1, 122)=7.40$, $p<.01$) and influences of covariables were insignificant ($ps>0.10$). The results supported our hypothesis and the results of Study 1. That is, calculation-based thinking has a positive influence on the binding effect of mental budgeting.

The results also showed a significant main effect of product type: Participants in the hedonic product condition had higher consumption willingness ($M=7.75$, $SD=1.45$) than those in the utilitarian product condition ($M=7.11$,

Fig. 1 Participants' consumption willingness in four conditions.
 Note: Error bars represent $\pm 1SE$



$SD=1.38$), $F(1, 126)=6.65$, $p<.05$, $\eta^2_p=0.05$. When participants' gender, income, and education level were included as covariables, the main effect of thinking mode did not change ($F(1, 122)=6.02$, $p<.05$). The results supported that the participants who just consumed hedonic products would exhibit lower levels of self-control in the following consumption.

The results also showed a marginal significant interaction between thinking mode and product type, $F(1, 124)=3.31$, $p=.065$, $\eta^2_p=0.03$. As depicted in Fig. 1, the post hoc analysis showed that participants in the hedonic product condition with the activation of the calculation-based thinking mode exhibited lower consumption willingness ($M=7.16$, $SD=1.51$) than those with the activation of the feeling-based thinking mode ($M=8.29$, $SD=1.18$), $F(1, 64)=9.20$, $p<.01$, $\eta^2_p=0.13$. In the utilitarian product condition, however, there was no difference in the consumption willingness of participants with the activation of the calculation-based thinking mode ($M=7.00$, $SD=1.30$) or the feeling-based thinking mode ($M=7.23$, $SD=1.48$), $F(1, 59)=0.31$, $p=.58$, $\eta^2_p=0.01$. When participants' gender, income, and education level were included as covariables, the interactive effect of thinking mode and product type was still approaching significant ($F(1, 122)=3.00$, $p=.09$). The results were consistent with our hypothesis that product type that participants just consumed moderated the effect of thinking

mode on mental budgeting. Specifically, the activation of calculation-based thinking exhibited a stronger self-control effect in participants who just consumed hedonic products than in participants who just consumed utilitarian products. Moreover, Study 2 did not find the significant influences of participants' education level again.

General discussion

Using college students and newcomers in the workplace as samples, this research first demonstrated that participants' lay rationalism thinking mode (i.e., calculation-based thinking) can predict their mental budgeting positively. Furthermore, an experimental design provides causal evidence of the positive effect of calculation-based thinking on the self-control mechanism of mental budgeting, as well as the moderating effect of product type. That is, calculation-based thinking exhibits a stronger binding effect in participants who just consumed hedonic products than in participants who just consumed utilitarian products.

Mental budgeting is regarded as a self-control mechanism in consumption (Heath & Soll, 1996). It was revealed that the self-control mechanism of mental budgeting was influenced by factors such as the characteristics of consumed products, offers of discounts, payment ways, and

consumers' thinking modes (Antonides et al., 2011; Cheema & Soman, 2006; Elgeka & Ma, 2020; Soman, 2001; Soman & Lam, 2002; Ülkümen et al., 2008). Previous literature has debated whether mental budgeting is mainly a function of calculation-based thinking or a function of feeling-based thinking (Krishnamurthy & Prokopec, 2010; Soman, 2001). Based on the lay rationalism view that the two thinking modes are two polars of one construct (Hsee et al., 2015), this study found that calculation-based thinking played a positive role in mental budgeting. In other words, feeling-based thinking had a negative effect on mental budgeting. Mental budgeting involves two processes: budgets setting and expense tracking (Heath & Soll, 1996). A valid mental budgeting asks consumers to set rational budgets for different expenses according to their disposable accounts and historical expenses and to keep track of the expenses during a specific period. Therefore, deliberate and calculation-based thinking exhibited a positive effect on mental budgeting. This viewpoint was also supported by previous literature (Lieberman et al., 2002; Pham et al., 2015; Raghurir & Srivastava, 2008; Soman, 2001). For example, the ambiguity of the product category of expenses (Heath & Soll, 1996) and the incompatibility between the units of budgets and expenses (Krishnamurthy & Prokopec, 2010) increased the difficulty of deliberate calculation, and thus hindered the binding effect of mental budgeting.

The current research not only supported the positive effect of calculation-based thinking on mental budgeting, but also indicated a negative effect of feeling-based thinking on mental budgeting. On the one hand, lay rationalism thinking mode is a variable with individual differences (Hsee et al., 2015; Palmatier & Crecelius, 2019). Individuals with higher levels of feeling-based thinking are inclined to make decisions or judgments according to their subjective feelings (usually is the kind of good feeling) rather than calculation and rationality. On the other hand, the dominant thinking mode may vary with changes in the situation. From this point of view, although this study revealed the negative effect of feeling-based thinking on mental budgeting, we do not deny the positive effect of negative emotions on the binding effect of mental budgeting (e.g. Mazar et al., 2017). For example, Soman (2001) found that participants who paid by credit card would experience lower levels of pain (known as payment pain) on mental budgeting and thus exhibited lower levels of self-control in future spending. Inspired by Fazio and Olson (2003) who proposed the influences of opportunity and motivation on behaviors, we suggested that the pain of payment as a signal of cost or loss might activate one's deliberate calculation-based thinking, and finally lead to the binding effect of mental budgeting. In other words, the negative emotion of payment pain may

be an inducement of calculation-based thinking, although further research evidence is needed.

This study also found that calculation-based thinking exhibited a stronger binding effect in participants who just consumed hedonic products than in participants who just consumed utilitarian products. There is abundant evidence that the activities that participants are undertaking can activate their corresponding mental state or thinking mode (e.g., Stepanova et al., 2018; Sussman et al., 2015; Zürn & Fritz, 2017). For example, the profits calculating tasks can facilitate participants to think about their own interests and make rational decisions (Xin & Liu, 2013). Indeed, social psychologists and behavioral economists have regarded the activities that participants are undertaking as an important approach to prime a specific mindset (Bargh & Chartrand, 2014; Cohn & Maréchal, 2016). Considering the relationships between thinking modes and contextual factors (i.e., product type) (Epstein, 1994; Hsee et al., 2015; Hsee & Rotenstreich, 2004; Kahneman & Frederick, 2002; Metcalfe & Mischel, 1999; Sloman, 1996), the simulated consumption of hedonic goods in Study 2 may activate participants' feeling-based thinking, while the consumption of utilitarian goods may activate participants' calculation-based thinking. For those participants whose calculation-based thinking had been activated by the experimental manipulation, their consumption would be constrained, no matter what type of products they had just consumed, whereas for those participants whose feeling-based thinking had been activated by the experimental manipulation, they had one more opportunity to constrain their consumption, i.e., consuming utilitarian products or considering the utilities of products. To conclude, the results showed that as long as calculation-based thinking was activated (either by the experimental manipulation or by utilitarian products), mental budgeting worked. Therefore, this study supported that mental budgeting is mainly a process of calculation-based thinking.

Two samples of newcomers in workplace were involved in Studies 1b and 2 respectively. In our viewpoint, investigating the mental budgeting and lay rationalism thinking mode of newcomers in the workplace has several advantages. On the one hand, these young people have a lower level of responsibility of raising a family, therefore, they are more likely to engage in impulsive consumption. At the same time, they have a lower level of income. According to the statistical data of employees' salary in Beijing (Beijing Municipal Bureau of Statistics, 2022; Beijing Municipal Human Resources and Social Security Bureau, 2021), the average monthly salary of employees in 2021 was 13, 876 Yuan (RMB) and the starting monthly salary of college students in 2021 was between 4, 000 and 11, 000 Yuan (RMB). In Studies 1b and 2, however, most of participants had a salary between 3,001 and 9,000 Yuan (RMB). It seems that the

samples in these studies had a relative lower income than the general population in Beijing and thus were more likely to experience an imbalance in income and expenditure, which increases the salience of investigating influencing factors of their consumption. On the other hand, in contrast to the general population, newcomers in the workplace were more comparable with college students in several dimensions such as age, education level, and experiences of consumption. Therefore, the results based on the two kinds of samples were less likely influenced by the other moderating factors so as to reach consistent conclusions.

The current research has substantial theoretical and practical implications. It has proposed and confirmed the view that mental budgeting is mainly a process of calculation-based thinking whenever calculation-based thinking is regarded as an individual difference variable or an experimentally manipulated variable. In practice, the results indicate that consumers with the demands of self-control in consumption should improve or prime their calculation-based thinking. According to the present findings and the view of nudging (Thaler & Sunstein, 2008), making the utilitarian functions of products salient or requiring people to perform calculation tasks may be a valid way to facilitate the binding effect of mental budgeting. Of course, merchants can utilize these findings in a reverse way.

Although there are the aforementioned implications, several limitations should be noted and overcome in further research. First, people's mental budgeting in the present research was measured either by a scale or by a simulated consumption task. Future studies may evaluate participants' mental budgeting by behavioral indicators such as the overdrafts account of credit card and the ratio of consumption to savings. Second, although the present results supported the positive role of calculation-based thinking in mental budgeting, there was evidence that heuristics and feeling-based thinking were adaptive in some specific situations (Haselton & Buss, 2000; Haselton & Nettle, 2006), and future studies may investigate whether and how the two thinking modes affect mental budgeting differently with changes in consumption situations. Finally, the current research was conducted under the view of lay rationalism, several other variables were related to the lay rationalism and mental budgeting, such as delaying gratification (Mischel, 1996) and faith in intuition (Epstein et al., 1996). Future studies may distinguish their effects from lay rationalism or examine the interactions between them.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s12144-022-03689-5>.

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