

## The interactive effects of bitter flavor and mood on the decision to spend or save money

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### **Abstract:**

People are more inclined to spend money when they are happy than when they are sad. However, unobtrusive situational factors that activate the concepts of a bitter life can reverse these effects. In line with this reasoning, our research shows that drinking a bitter beverage increases happy participants' inclination to save money but decreases unhappy participants' disposition to do so. These effects were confirmed in three lab experiments. Moreover, two field studies provided evidence that the results generalize to actual savings decisions and to impulsive purchases in an actual shopping situation.

**Keywords:** mood | saving | bitter taste | bitter life | precautionary motivation

### **Article:**

Three decades of research have been concerned with the way that people's mood can influence their processing of information. Although this stream of research has taken many directions, it has largely centered around two general effects. First, individuals use the positive or negative mood they are experiencing at the time they judge a stimulus as information about their reactions to the stimulus and evaluate it more favorably when they feel happy than when they do not (e.g., Schwarz and Clore, 1983, Schwarz and Clore, 1996). Second, people's mood can have a motivational influence (Cohen and Andrade, 2004, Isen, 1984). That is, individuals who feel unhappy are motivated to eliminate these negative feelings by engaging in a behavior that is likely to accomplish this objective (Cohen & Andrade, 2004). However, the informational and motivational influences of affect are not independent. As Schwarz, Bless, and Bohner (1991) noted, happy people typically infer that the situation they happen to be in is benign and consequently are not motivated to process information systematically. In contrast, unhappy persons interpret the situation as potentially threatening and are motivated to think more carefully about features of the situation and their implications (Bless, Bohner, Schwarz, & Strack, 1990).

Despite the large amount of research and theories surrounding these effects (for reviews, see Bower and Cohen, 2014, Clore et al., 2001, Schwarz and Clore, 1996, Wyer et al., 1998), one possible influence of affect has seldom been considered, namely, its influence on how and when

people use their previously acquired knowledge as a basis for judgments and decisions. The research to be reported investigated the nature of this influence.

In doing so, we focused on decisions of a sort that occur frequently in daily life. People who receive an unexpected sum of money (i.e., a gift, an income tax refund, etc.) often decide whether to spend the money or to save it. In many cases, they may not think very carefully about these decisions. Rather, they may simply base their decision on what mood they happen to be in at that time. For example, people may spend more money when they are in a good mood than when they are not, independent of other considerations.

When people think more deliberately about a savings decision, however, this decision is likely to depend on both (a) their expectation that a negative event might occur and whether the money would help them alleviate such an aversive situation, and (b) whether they perceive such an event to be imminent. These perceptions, however, may depend on their mood. Happy individuals may consider their present situation to be benign (Schwarz et al., 1991) and that a negative experience is unlikely. Consequently, they may believe that the misfortune they are contemplating is more likely to occur in the future, and decide to save the money as a safeguard against its occurrence. In contrast, unhappy individuals who contemplate an adversity are more likely to imagine that it could be imminent and may decide to spend money in an attempt to minimize its unpleasant consequences.

To increase the likelihood that individuals engage in this deliberation in the studies we report, we used an unobtrusive procedure to induce participants to contemplate a negative life event. Specifically, we asked participants to drink a bitter-taste beverage before they considered whether to spend or save a given amount of money. So, a key question to be addressed by this research is: Does bitter taste increase or decrease consumers' propensity to save or spend? Based on evidence that sensory experiences activate the concepts that can have metaphorical implications for the information people receive (Barsalou, 2008, Lakoff and Johnson, 2008), we assumed that tasting a bitter drink would activate concepts of bitterness and that these concepts, once accessible in memory, would influence people's interpretation of the life situation that came to mind when they were later confronted with a savings decision. (For evidence that a bitter taste can activate concepts that influence behaviors in quite unrelated situations, see Ding et al., 2016, Erskine et al., 2011). We further assumed that whether persons considered this situation to be relevant to their present life or to their future life would depend on the mood they were in at the time. As a result, bitter taste (or salience of the concepts associated with a "bitter" life) may increase or decrease individuals' tendency to save, depending upon their mood at the time of making the savings decision. The basis for our predictions is elaborated in the next section.

## **1. Theoretical background**

### **1.1. Affect and information processing**

Two somewhat contradictory conceptualizations of the role of affect in information processing were proposed by Zajonc (1980) and Bower (1981). Zajonc postulated that affect and cognition are governed by separate systems that influence judgments and decisions. In contrast, Bower (1981) conceptualized affect and emotions as semantic concepts that influence information

processing (comprehension, memory, and judgment) in much the same way as do other concepts. Although many specific assumptions of these theories have been disconfirmed (Wyer et al., 1998), they have continued to stimulate a large amount of research and theorizing.

Current formulations of affect and cognition consider motivational factors, cognitive factors, or both. Motivational theories (e.g., Cohen and Andrade, 2004, Isen, 1984; see also Andrade, 2005) assume that negative affect is aversive and that individuals who experience this affect are motivated to decrease or eliminate these feelings. Another conceptualization of affect and cognition implies that affect can have both informational and motivational influences (Schwarz and Clore, 1983, Schwarz and Clore, 1996). According to this theory, people attribute the positive or negative affect they experience in a situation to the stimuli they happen to be thinking about at that time and use their mood as a basis for evaluating the stimuli. These stimuli could include physical objects, personal experiences, or the situation as a whole. Thus, happy people are more likely than unhappy people to judge the stimuli more favorably (Strack et al., 1988, Yeung and Wyer, 2004), to report higher life satisfaction (Schwarz & Clore, 1983) and higher self-esteem (Levine, Wyer, & Schwarz, 1994), and to evaluate their cognitive responses to a persuasive communication as more valid (Wegener, Petty, & Smith, 1995). According to Schwarz et al. (1991), individuals who experience positive affect at the time they encounter a situation are inclined to infer that the situation is benign and unproblematic. Therefore, they process the information in the situation more superficially and base judgments on more global criteria (Bless et al., 1990). In contrast, individuals who experience negative affect perceive the situation to be problematic and consequently give more attention to details of the information they encounter.

An important implication of the theory has not often been examined, however. That is, people's use of affect as information is likely to depend on its relevance to the stimuli being judged. The evidence bearing on this possibility is limited. However, a series of studies by Förster and Strack (1996); see also Neumann, Förster, & Strack, 2003) found evidence that concepts activated by bodily sensations only influence judgments of stimuli if they are applicable. For example, flexing one's arms (approach behavior that elicits positive affect) influences evaluations of positive stimuli but not negative ones (for a similar contingency, see Centerbar & Centerbar & Clore, 2006).

The present research considered implications of this contingency. Suppose individuals who experience positive or negative affect perceive their current situation to be benign or problematic, respectively. These different perceptions are likely to affect their thoughts about the quality of life events that are evaluatively consistent or inconsistent with their current life situation. For example, if happy people think about the possibility of having a negative life experience and speculate about when the negative event is likely to occur, they may perceive the event as inconsistent with their immediate life situation and consider the negative event to be more relevant to their future life. In contrast, unhappy people may perceive the event to be consistent with their current life circumstances, and thus may view the negative event as imminent.

These possibilities have implications for the effect of people's mood on their savings decisions. Suppose individuals who are contemplating whether to spend or save money consider the

possibility that they might encounter a misfortune. In this case, happy individuals may perceive the adversity to be inconsistent with their current life situation and thus to be more likely to occur in the future. Therefore, they may be inclined to save money as a hedge against its future occurrence. In contrast, unhappy persons are more likely to see the adversity as consistent with their immediate life situation and thus as potentially imminent. These persons, therefore, may be inclined to spend the money on immediate gratification to offset the effects of such an adverse event. These contingencies should only occur, however, if individuals happen to think about an aversive life event at the time they contemplate a savings decision. We now consider conditions in which this might occur.

## 1.2. Bitter taste and bitter life

Taste can influence human behavior at a very early age. Infants show hedonically positive responses to sweet tastes, such as relaxation, increased sucking (Steiner, 1973), and elevated heart rate (Lipsitt, 1979). When they taste something bitter, however, they spontaneously exhibit negative behaviors such as grimacing (Peiper, 1963, Steiner, 1973) and a disruption of sucking (Rosenstein & Oster, 1988). In fact, recent neuroscience research indicates that bitterness activates a brain area that governs aversion (Trivedi, 2012). This evidence suggests an inherent association between a bitter taste and avoidance reactions. The use of “bitter” to describe an unpleasant situation is not restricted to taste and could be generalized to other types of negative experiences, leading these experiences to be described as “bitter” as well. Thus, it is common to describe subzero temperatures as “bitter cold”, and impoverished circumstances as a “bitter life.”

This generalizability is implied by research on embodied cognition (Barsalou, 2008, Landau et al., 2010). Lakoff and Johnson (2008); see also Williams, Huang, & Bargh, 2009) suggested that because a metaphor's meaning is grounded in physical experiences, concepts that are activated by body sensations can increase the accessibility of other concepts with which they are metaphorically linked, increasing the likelihood that the latter concepts are applied to features of a new stimulus to which they are applicable. Thus, physical warmth can lead people to judge a stranger to be personally warm (Williams & Bargh, 2008), carrying a heavy bag can influence judgments of importance (Zhang & Li, 2012), and encountering a fishy smell can increase suspiciousness (Lee & Schwarz, 2012).

The effect of a bitter taste may be analogous. Experiencing a bitter taste can activate semantic concepts of bitterness that are metaphorically associated with concepts of other objectively unrelated situations. Thus, bitter tastes elicit more negative evaluations of stimuli than sweet tastes (Ding et al., 2016) and increase the severity of moral judgments (Erskine et al., 2011). Moreover, as these studies suggest, the interpretation of “bitter” may depend on the type of stimuli being judged. When applied to a person, for example, “bitter” conveys anger and resentment, whereas when applied to one's life circumstances, “bitter” implies extreme harshness. We assumed that experiencing a bitter taste would activate semantic concepts of bitterness that are metaphorically applicable to one's life and the conditions surrounding it. We therefore expected it to influence savings decisions, depending on the situation to which the concepts are applied.

### 1.3. Summary and hypotheses

The preceding discussion suggests that although concepts activated by a bitter taste are likely to influence savings decisions, the nature of this influence depends on the mood they happen to be in at the time. In considering this possibility, we recognized that people often decide whether to spend or save money without thinking about the long-term consequences of this decision, especially when the amount of money is not large. Thus, happy persons may perceive that their immediate situation is benign and may feel free to spend money on immediate gratification without thinking about the consequences of doing so (Schwarz et al., 1991). In contrast, unhappy individuals are likely to perceive their present situation as problematic and are inclined to be cautious (Frijda, 2005, Lench et al., 2011, Raghunathan and Pham, 1999). To this extent, they may be disposed to save money without thinking about when they might need it.

Different considerations arise, however, when individuals have consumed a bitter food or beverage before making a savings decision. If the concepts associated with bitterness are salient when these individuals are deciding whether to spend or save money, they may apply these concepts to the life circumstances to which these concepts are most likely to be applicable and may base their savings decision on the implications of these concepts. Thus, happy individuals are likely to consider bitterness-related concepts to be inapplicable to their current life situation (benign and unproblematic) and to apply them to their future life instead. (For evidence that happy people are generally more disposed to think about the future than unhappy people, see Hornik, 1993, Labroo and Patrick, 2009) Thus, they are inclined to save money as a safeguard against this bitter future state. In contrast, unhappy individuals are more inclined to apply bitterness-related concepts to their present life situation. Therefore, they tend to spend money to alleviate this unpleasant state. That is:

**H1.** When individuals feel happy at the time they make a savings decision, tasting a bitter drink will increase their likelihood of deciding to save.

**H2.** When individuals feel unhappy at the time they make a savings decision, tasting a bitter drink will decrease their likelihood of deciding to save.

Three laboratory experiments and two field studies provided support for these hypotheses and the assumptions on which they were based.

Note. In the studies to be reported, all measures, manipulations, and exclusions are disclosed. We determined the sample size of Experiments 1, 2 and 5 on the basis of the existing literature (Ding et al., 2016, Erskine et al., 2011), and based the sample size of Experiment 3 on a power analysis using the results of our other experiments (see online Supplementary materials for detailed information).

## 2. Pretests

Our conceptualization assumes that: (a) physically experiencing a bitter taste can make bitterness-related concepts accessible in one's memory, and (b) the accessibility of these

bitterness-related concepts stimulates individuals to think about a bitter life. Two pretests confirmed these assumptions.

## 2.1. Pretest 1

### 2.1.1. Method

The first pretest confirmed our assumption that thinking about a bitter-taste beverage and thinking about a harsh life experience both make the concept “bitter” more accessible in one's memory.

Fifty-two Hong Kong university students participated in this pretest. They were randomly assigned to two conditions (thinking about drinking black coffee vs. thinking about a harsh life situation). Participants were told that we were interested in people's spontaneous reactions to life events. In one condition, they were asked to “imagine that you have been given a beverage without knowing what it is and, after tasting it, find it to be dark black coffee without any sugar or milk.” Then, they indicated the likelihood that they would describe the taste of the drink as “bitter” along a scale from 0 (*not at all*) to 10 (*very*). In a second condition, participants were told to “imagine that your future life turns out to be very difficult, and you have lost your job and have little money for food and other necessities.” Then, these participants indicated the likelihood of describing their life as “bitter” along a similar scale.

### 2.1.2. Results

Participants were more likely to describe black coffee as bitter ( $M = 7.67$ ,  $SD = 2.27$ ) than to describe the hard life as bitter ( $M = 6.16$ ,  $SD = 2.53$ ),  $F(1, 50) = 5.13$ ,  $p = 0.028$ ,  $\eta^2 = 0.09$ . In both cases, however, participants' ratings were significantly above the scale midpoint of 5.0,  $t(26) = 6.10$ ,  $p = 0.000$  and  $t(24) = 2.29$ ,  $p = 0.031$ , respectively. Thus, a concept of bitterness was activated in both conditions.

## 2.2. Pretest 2

### 2.2.1. Method

The second pretest provided further evidence that tasting something bitter activates concepts associated with a bitter life. Forty participants (47.5% women;  $M_{age} = 21.88$ ,  $SD = 3.70$ ) were randomly assigned to one of three blind-taste-test conditions. They were told that two unrelated experiments were being conducted. The first was ostensibly a blind taste test that was intended to assess individuals' experience with different tastes. On this pretense, participants were each given an opaque cup with a lid that contained about 20 ml of (a) bitter melon water, (b) salty water, or (c) pure water, and were asked to drink the beverage very slowly. Then, they indicated their liking for the beverage along a scale from 1 (*not at all*) to 10 (*very much*) and reported how they felt right after tasting the drink along a scale from  $-3$  (*very negative*) to  $+3$  (*very positive*).

The second task was allegedly being conducted by a social psychology professor who was interested in students' life in general. On this pretense, they were given 2 min to think about their

future life. After doing so, they wrote down five adjectives that came to their mind most easily at that time.

### 2.2.2. Results

The impact of taste on participants' liking for the beverages was significant,  $F(2, 37) = 12.50$ ,  $p = 0.000$ ,  $\eta^2 = 0.40$ . Planned contrasts showed that participants liked pure water ( $M = 4.25$ ,  $SD = 1.42$ ) more than either bitter melon water ( $M = 2.25$ ,  $SD = 1.44$ ),  $t(26) = 3.67$ ,  $p = 0.001$ , or salty water ( $M = 1.75$ ,  $SD = 0.97$ ),  $t(22) = 5.04$ ,  $p = 0.000$ . But, salty water and bitter melon water did not differ in likeableness,  $t(37) = 0.99$ ,  $p = 0.32$ . Furthermore, the impact of taste on participants' reported feelings was also significant,  $F(2, 37) = 7.56$ ,  $p = 0.002$ ,  $\eta^2 = 0.29$ . People reported feeling more negatively after tasting bitter melon water ( $M = -0.69$ ,  $SD = 1.35$ ) than after tasting pure water ( $M = 0.50$ ,  $SD = 1.24$ ),  $t(26) = 2.38$ ,  $p = 0.025$ . Similarly, people also felt more negatively after tasting salty water ( $M = -1.33$ ,  $SD = 1.35$ ) than after tasting pure water ( $M = 0.50$ ,  $SD = 1.24$ ),  $t(22) = 4.33$ ,  $p = 0.000$ .

Next, we counted the number of adjectives specifically related to a bitter life that participants generated after thinking about their future life (i.e., harsh, hard, difficult, bitter, and suffer). This number was significantly greater when participants had tasted a bitter melon drink ( $M = 1.25$ ,  $SD = 0.45$ ) than when they had tasted either a salty drink ( $M = 0.25$ ,  $SD = 0.45$ ) or pure water ( $M = 0.08$ ,  $SD = 0.29$ ),  $F(2, 37) = 34.30$ ,  $p = 0.000$ ,  $\eta^2 = 0.65$ . Taken together, these results indicate that although both bitter melon water and salty water could generate negative experiences, only tasting bitter melon water affected participants' perceptions of a bitter life.

In combination, the two pretests show that bitterness concepts are activated when consumers think about drinking a bitter tasting beverage or think about a harsh life situation (Pretest 1), or when they physically taste something bitter (Pretest 2), and that the bitterness concepts activated by tasting something bitter make participants more accessible to the concepts of a bitter life when thinking about their future (Pretest 2).

## 3. Experiment 1

According to our conceptualization, tasting a bitter drink activates bitterness-related semantic concepts and individuals later apply these concepts in construing their life situation at the time they make a savings decision. Furthermore, whether people apply these concepts to their future life or to their present life circumstances (and, therefore, whether they decide to save money or spend it) depends on the mood they happen to be in. Although our pretests confirmed the assumption that tasting a bitter drink activated semantic concepts associated with a bitter life, it was desirable to ensure that the salience of these concepts affects savings decisions independently of the manner in which they are activated. Experiment 1 examined this possibility.

### 3.1. Method

One hundred fifty-four American college students (57.1% women) took part in the experiment for partial course credits. They were randomly assigned to the conditions of a 3 (mood: happy vs. sad vs. control)  $\times$  2 (concept priming: bitter life vs. neutral) between-subjects design.

Participants were told that they would take part in three unrelated tasks. In the first task, we manipulated participants' mood using a procedure similar to that employed by Adaval (2001); see also Schwarz & Clore, 1983). A psychology professor who was interested in acquiring information about personal experiences of college students was ostensibly conducting the first task. On this pretense, participants in *happy mood* conditions were asked to recall a recent event that made them happy whenever they thought about it. In contrast, participants in *sad mood* conditions were asked to recall an experience that made them sad whenever they thought about it. In *control* conditions, participants described a routine event that had happened in their life.

After completing the writing task, which took about 10 min, participants indicated how they felt along a scale from 1 (*very bad*) to 9 (*very good*) and reported their experience of three positive emotions (happy, pleasant, and delighted;  $\alpha = 0.98$ ) and three negative ones (sad, unpleasant, and distressed;  $\alpha = 0.90$ ) along scales from 1 (not at all) to 9 (very much). Responses to the items in each set were averaged to provide a second indication of their mood.

Participants then performed a word construction task in which they were asked to construct words from sets of scrambled letters. In the *bitter-life priming* condition, 5 out of the 20 words were associated with a bitter life (i.e., harsh, hard, bitter, difficult, and suffer). In the *neutral priming* condition, all 20 words were neutral (e.g., leaf, watch, head, word, and software).

In the savings decision task, participants were told to imagine that they unexpectedly received extra money of \$300 per month from then until the end of the year as a result of a Tuition Waiver Program (at that time, there was indeed such a program on campus), and to indicate the proportion of this money that they would like to save for future use and the reason for their savings decision.

Finally, they reported gender, age, income, and work status. These variables consistently showed no effect in this study and the subsequent studies; therefore, we will not discuss their effects further.

## 3.2. Results

### 3.2.1. Manipulation check

Mood was successfully manipulated. Participants reported feeling more positively when they had recalled a happy life experience ( $M = 8.58$ ,  $SD = 0.28$ ) than when they had recalled either a neutral experience ( $M = 6.08$ ,  $SD = 0.26$ ) or a sad one ( $M = 3.09$ ,  $SD = 0.27$ ),  $F(2, 148) = 98.86$ ,  $p = 0.000$ ,  $\eta^2 = 0.57$ . Analyses of specific emotions exhibited a similar pattern. Participants' reports of positive emotions were 8.53 ( $SD = 0.29$ ), 5.43 ( $SD = 0.27$ ), and 2.28 ( $SD = 0.28$ ) in happy mood, control, and sad mood conditions, respectively,  $F(2, 148) = 118.94$ ,  $p = 0.000$ ,  $\eta^2 = 0.62$ . However, their reports of negative emotions were 1.49 ( $SD = 0.24$ ), 2.67 ( $SD = 0.23$ ), and 6.20 ( $SD = 0.24$ ), respectively,  $F(2, 148) = 105.26$ ,  $p = 0.000$ ,  $\eta^2 = 0.59$ . These effects did not depend on the nature of the primed concepts ( $p$ 's  $> 0.15$ ).

### 3.2.2. Saving percentage

We expected that activating semantic concepts associated with bitterness would lead happy participants to apply these concepts to their future life, disposing them to save. In contrast, it should lead unhappy participants to apply the concepts to their current life situation and consequently dispose them to spend. These expectations were confirmed. The proportion of the extra money that participants intended to save is shown in Table 1 as a function of mood and concept priming. The interaction of these variables was significant,  $F(2, 148) = 4.52, p = 0.012, \eta^2 = 0.06$ . Happy participants estimated they would save more money when bitterness-related concepts were primed ( $M = 71\%$ ) than when they were not ( $M = 53\%$ ),  $F(1, 148) = 4.61, p = 0.03$ . Sad participants, however, estimated that they would save *less* money in the former condition ( $M = 44\%$ ) than in the latter ( $M = 59\%$ ),  $F(1, 148) = 3.10, p = 0.08$ . Finally, participants in control conditions, like those in happy conditions, reported a marginally greater disposition to save money when bitterness-related concepts had been primed ( $M = 61\%$ ) than when they had not ( $M = 47\%$ ),  $F(1, 148) = 2.87, p = 0.10$ .

**Table 1.** The percentage of money saved as function of mood and priming conditions: Experiment 1.

	Mood		
	Happy	Sad	Neutral
Saving percentage out of \$300			
Priming concepts related to bitter life	71.36% (24.20%)	44.11% (26.25%)	60.77% (34.99%)
Priming neutral concepts	53.27% (28.01%)	58.65% (24.65%)	47.29% (34.42%)
$M_{diff}$	18.09% <sup>a</sup>	- 14.54%	13.48%
Percentage of participants with precautionary motive			
Priming concepts related to bitter life	52.00% (51%)	14.29% (35.86%)	40.00% (50%)
Priming neutral concepts	17.39% (38.76%)	38.71% (49.51%)	17.24% (38.44%)
$M_{diff}$	34.61% <sup>a</sup>	- 24.42% <sup>a</sup>	22.76% <sup>a</sup>

<sup>a</sup> Differences are significant at  $p < 0.05$ .

### 3.2.3. Precautionary motivation

We expected that happy individuals' decisions to save money would be based on their concern about the possibility of a bitter future life and their motivation to guard against this eventuality. To evaluate this possibility, two graduate students who were blind to our hypotheses were given the definition of a precautionary motive, namely, "to build up a reserve against unforeseen contingencies" (Browning and Lusardi, 1996, Keynes, 1937), and two criteria for inferring such a motive: (a) whether it is intended to prevent a negative event from happening, and (b) whether the event to be prevented is unpredictable. The two judges then coded the reasons that participants gave for their savings decision in terms of whether they reflected a precautionary motive or not. The typical reasons provided by participants include "I would like to have money put away for a rainy day, and knowing that I have available funds for any financial mishaps gives me a feeling of security", "For any type of emergency in the future", and "I like to save just to

have back-up money in case of an emergency, or large unexpected expenses". Inter-coder agreement was 83% ( $Kappa = 0.63, p = 0.000$ ) and disagreements were solved through discussions.

The proportion of participants who listed a precautionary motive in each condition is summarized in the second section of Table 1. The interaction of mood and concept priming was significant,  $F(2, 148) = 6.06, p = 0.003, \eta^2 = 0.08$ . Happy participants were more likely to generate precautionary motives when concepts associated with a bitter life were primed ( $M = 52\%$ ) than when neutral concepts were primed ( $M = 17\%$ ),  $F(1, 148) = 7.18, p = 0.008$ . This was also true in control conditions ( $M_{bitter-concept} = 40\%$  vs.  $M_{neutral-concept} = 17\%$ ),  $F(1, 148) = 3.48, p = 0.060$ . Unhappy participants, however, were less likely to generate precautionary reasons when bitterness-related concepts were primed ( $M = 14\%$ ) than when neutral concepts were primed ( $M = 39\%$ ),  $F(1, 148) = 3.74, p = 0.055$ .

## 4. Experiment 2

The results of Experiment 1 confirmed our assumption that priming bitterness-related semantic concepts would increase happy individuals' precautionary motives and their desire to save money. But priming these same concepts reduced sad participants' concern about the future and decreased their intention to save. If tasting a bitter drink spontaneously activates concepts associated with bitterness, it should have similar effects.

Experiment 2 investigated this possibility. After inducing participants to feel either happy or sad by recalling a past experience, they were asked to take part in a blind taste test and, on this pretense, were given a drink of either pure water or bitter melon water. We expected that tasting a bitter drink would increase the likelihood that happy participants decide to save but decrease the likelihood that unhappy participants to do so.

In evaluating this hypothesis, it was important to determine whether the effects we observed were specific to tasting a bitter drink or whether other unpleasant experiences would have a similar effect. The effect of drinking a bitter tasting beverage on happy participants' expectations for their future life seemed unlikely to generalize to experiences to which concepts of bitterness were irrelevant. However, the effects of unpleasant experiences on sad participants' savings decisions are less clear. As we noted earlier, unhappy individuals are generally motivated to engage in behavior that can decrease or eliminate their negative feelings they are experiencing (Andrade, 2005, Isen, 1984). If tasting a bitter drink activates thoughts about the adversity of their present life situation, it could increase their desire to spend money for this reason. To this extent, however, other unpleasant experiences that call unhappy individuals' attention to their immediate circumstances (e.g., drinking salty water) could have similar effects. To investigate this possibility, we added a salty drink condition into this experiment. We expected that although a salty drink was unlikely to affect happy participants' savings decisions, it might have an effect on sad participants' decisions that was similar to the effect of a bitter drink.

### 4.1. Method

One hundred fifty-three Chinese college students (51.6% women;  $M_{age} = 21.46$ ,  $SD = 2.81$ ) participated for a compensation of ¥20 RMB (about \$3.25 USD). They were assigned to conditions of a 2 (mood: happy vs. sad)  $\times$  3 (beverage: bitter melon water vs. salty water vs. pure water) between-subjects design.

Participants were told that they would take part in three unrelated tasks concerning: (a) college students' life experiences, (b) a blind taste test, and (c) students' attitudes toward financial investment. In the first task, we manipulated participants' mood using a procedure similar to that employed in Experiment 1. After completing the writing task, which took about 10 min, they described their personal feelings along a scale from  $-3$  (*very bad*) to  $+3$  (*very good*) as a measure of general mood.

The second task was framed as a blind taste test that was designed to test humans' gustatory senses. On this pretense, participants were given a small opaque cup of bitter melon water, salty water, or pure water. After tasting the beverage, participants indicated the taste of the beverage (sweet, salty, sour, bitter, or no special taste), and the extent to which they liked it along a scale from 1 (*not at all*) to 7 (*very much*).

Finally, participants were informed that we were helping a national bank to collect information about college students' attitude toward financial investment. Participants first answered several questions about their gender, age, grade, and monthly allowance. Then, they were asked to imagine that they had received an extra ¥500 RMB allowance every month (about \$81.25 USD) and indicated the likelihood that they would save the money along a scale from  $-3$  (*definitely no*) to  $+3$  (*definitely yes*).

After making their savings decision, participants indicated the extent to which they agreed that they were worrying about their future at the time they made their savings decision along a scale from  $-3$  (*totally disagree*) to  $+3$  (*totally agree*).

## 4.2. Results

### 4.2.1. Manipulation checks

Participants' mood was successfully manipulated. Participants felt more positively in happy mood conditions ( $M = 1.52$ ,  $SD = 0.17$ ) than in sad mood conditions ( $M = -0.32$ ,  $SD = 0.17$ ),  $F(1, 146) = 58.67$ ,  $p = 0.000$ ,  $\eta^2 = 0.29$ , one missing data point. All participants correctly identified the taste of the beverage. Furthermore, participants liked pure water ( $M = 4.14$ ,  $SD = 0.16$ ) more than either salty water ( $M = 2.24$ ,  $SD = 0.17$ ) or bitter melon water ( $M = 2.04$ ,  $SD = 0.18$ ),  $F(2, 147) = 48.21$ ,  $p = 0.000$ ,  $\eta^2 = 0.40$ , and this effect was not contingent on mood.

### 4.2.2. Likelihood of saving

We hypothesized that after tasting a bitter drink, happy participants would increase their disposition to save (H1), whereas sad participants would decrease their disposition to do so (H2). We further speculated that although the effect of happy participants' consumption experience on

their savings decisions would be restricted to conditions in which they had tasted a bitter drink, its effect on sad participants' decisions might generalize to salty-taste conditions as well.

Data related to these hypotheses are summarized in the top section of Table 2. The interaction of mood and taste conditions was significant and of the form expected,  $F(2, 147) = 4.51, p = 0.013, \eta^2 = 0.06$ . Planned comparisons shown in the table indicate that participants in pure water conditions were more disposed to save money when they were sad ( $M = 1.79, SD = 1.50$ ) than when they were happy ( $M = 0.80, SD = 1.86$ ),  $F(1, 147) = 4.77, p = 0.031$ , consistent with expectations (Raghunathan & Pham, 1999). However, tasting a bitter drink increased happy participants' disposition to save money ( $M = 1.81, SD = 0.160$ ) relative to pure water conditions ( $M = 0.80, SD = 1.86$ ),  $F(1, 147) = 4.80, p = 0.03$ . However, tasting a salty drink had no such influence ( $M = 0.72, SD = 1.95$ ),  $F = 0.03, p = 0.86$ . None of the demographic indicators (i.e., gender, age, grade and monthly allowance) influenced participants' saving intentions.

**Table 2.** Saving likelihood, worrying about future, as function of mood and taste—Experiment 2.

	Mood	
	Happy	Sad
Saving likelihood		
Pure water	0.80 (1.86) <sup>b</sup>	1.79 (1.50) <sup>a</sup>
Bitter melon water	1.81 (1.60) <sup>a</sup>	0.75 (1.81) <sup>b</sup>
Salty water	0.72 (1.95) <sup>b</sup>	0.71 (1.81) <sup>b</sup>
Worry about future		
Pure water	- 0.20 (1.67) <sup>b</sup>	0.71 (1.36) <sup>a</sup>
Bitter melon water	0.77 (1.90) <sup>a</sup>	- 0.40 (1.82) <sup>b</sup>
Salty water	0.00 (1.73) <sup>ab</sup>	0.21 (1.69) <sup>ab</sup>

Cells with unlike superscripts differ at  $p < 0.05$ .

In contrast, tasting a bitter drink decreased sad participants' disposition to save ( $M = 0.75, SD = 1.81$ ) relative to tasting pure water ( $M = 1.79, SD = 1.50$ ),  $F(1, 147) = 4.25, p = 0.041$ . As we speculated, however, tasting a salty drink ( $M = 0.71, SD = 1.81$ ) also decreased sad participants' disposition to save relative to pure water conditions ( $M = 1.79, SD = 1.50$ ),  $F(1, 147) = 5.09, p = 0.026$ . Taken together, these results confirm our speculation that sad participants' spending decision is not restricted to the influence of their past consumption experience on their interpretation of their current life situation as “bitter.” More generally, the unpleasant feelings elicited by the taste, along with the negative affect they were experiencing, apparently led them to perceive their immediate life situation as unpleasant and motivated them to reduce or eliminate the negative feelings they were experiencing as a result of this perception (Andrade, 2005, Shen and Wyer, 2008). Therefore, although the effect of tasting a bitter drink on happy persons' decisions to save money was specific to this type of drink, the effect of taste on unhappy persons' decision to save money could be generalized to other unpleasant drinks as well.

#### 4.2.3. Worry about the future

Participants' concern about the future, summarized in the second section of Table 2, provided further confirmation for our assumptions concerning the factors that underlay their saving conditions. Specifically, the interaction of taste conditions and mood was significant,  $F(2,$

147) = 4.86,  $p = 0.009$ ,  $\eta^2 = 0.06$ . Happy participants worried more about their future after drinking bitter melon water ( $M = 0.77$ ,  $SD = 1.90$ ) than after drinking either salty water ( $M = 0.00$ ,  $SD = 1.73$ ),  $F(1, 147) = 2.63$ ,  $p = 0.107$ , or pure water ( $M = -0.20$ ,  $SD = 1.67$ ),  $F(1, 147) = 4.56$ ,  $p = 0.034$ . In contrast, sad participants worried less about their future after drinking either a bitter drink ( $M = -0.40$ ,  $SD = 1.82$ ) or after drinking a salty drink ( $M = 0.21$ ,  $SD = 1.69$ ) than after drinking plain water ( $M = 0.71$ ,  $SD = 1.36$ ), although only the first difference was significant,  $F(1, 147) = 5.05$ ,  $p = 0.026$ .

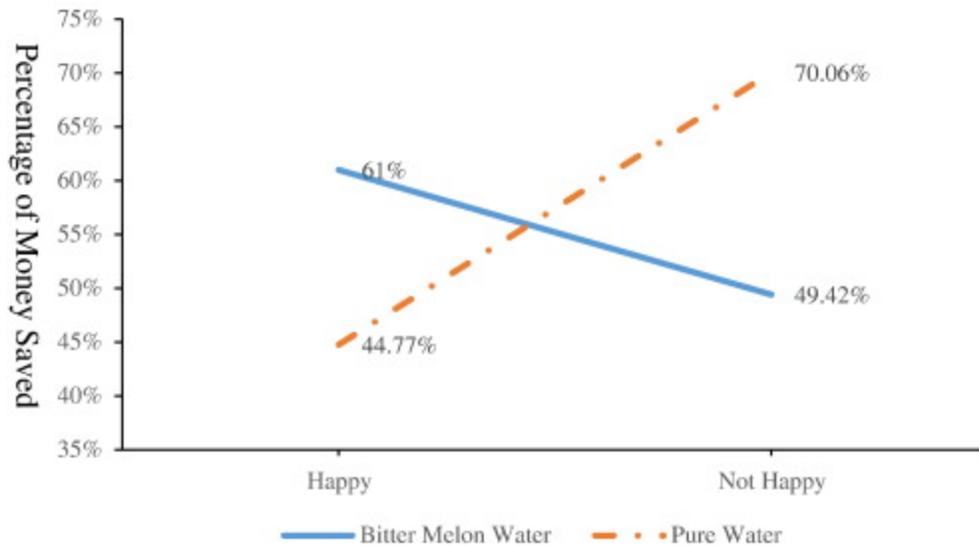
### 4.3. Follow-up study

#### 4.3.1. Method

To test the robustness of Experiment 2, we conducted a follow-up study. Forty-six undergraduate students (34.8% women;  $M_{age} = 24.61$ ,  $SD = 5.86$ ) from a major university in the southern United States participated for a \$5 Starbucks gift card. The experiment featured a 2 (taste: bitter vs. no special taste)  $\times$  2 (mood: happy vs. sad) mixed design, where taste was experimentally manipulated and mood was assessed. The procedure and measures were similar to those in Experiment 2 with two exceptions. First, mood was assessed and not manipulated; participants upon arriving at the experiment were first asked to indicate how they felt at that moment along a scale from  $-3$  (*very bad*) to  $+3$  (*very good*). Second, the savings decision task was the same as the task used in Experiment 1. All participants correctly identified the taste of the beverage.

#### 4.3.2. Results

A regression analysis was performed on the proportion of money that participants saved as a function of mood, taste, and their interaction term. The interaction term was significant and of the form expected,  $b = -1.52$ ,  $t(42) = -3.08$ ,  $p = 0.004$ ,  $R^2 = 0.19$  (see Fig. 1). The results of spotlight analysis indicated that happy participants (1  $SD$  above the mean) were more likely to save if they had tasted a bitter drink ( $M = 61\%$ ) than if they had not ( $M = 45\%$ ),  $t = 1.92$ ,  $p = 0.062$ . Conversely, unhappy participants (1  $SD$  below the mean) were less likely to save in the former condition ( $M = 49\%$ ) than in the latter ( $M = 70\%$ ),  $t = 2.45$ ,  $p = 0.019$ .



**Fig. 1.** The percentage of money saved as a function of mood and taste—follow-up study in Experiment 2.

#### 4.4. Discussion

Experiment 2 demonstrated the interactive effects of mood and bitter taste on consumers' savings decisions. Furthermore, it provided direct evidence on the process through which the effects occur. When participants were feeling happy, drinking something bitter made them more likely to worry about their future and increased their disposition to save money rather than spending it. When participants were feeling unhappy, however, drinking something that was either bitter or salty motivated them to eliminate the aversive state they were in by spending money rather than by saving it. This finding may qualify our hypothesis concerning the effects of activating bitterness-related concepts per se. Although happy participants' savings decisions were likely to be influenced by the accessibility of these concepts, sad participants' decisions have been influenced by mood-repair motivation as well.

Furthermore, Experiments 1 and 2 in combination showed that the effect we found exists in both Chinese culture and American culture.

### 5. Experiment 3

The results of Experiment 2 and the follow-up study both provide evidence that tasting a bitter drink had different effects on participants' savings decisions, depending on their mood. However, because the sample size employed in these studies was relatively small, we conducted a partial replication of the experiment using a larger sample.

In order to decide the sample size for Experiment 3, we firstly conducted a meta-analysis (see online material for detailed description). Our meta-analysis database contains ten effect sizes, of which three are in negative-mood and seven in positive-mood conditions. The means, standard deviations, and sample sizes of both the bitter taste and the control conditions for each observation were coded into the Comprehensive Meta Analysis (CMV) 2.0 software to calculate

Cohen's  $d$ . Furthermore, we used the CMV software to compute standardized correlation  $r$  from  $d$ . The mean standardized  $r$  across the studies in our database is 0.126 ( $p = 0.187$ ) in the random effects model, which is not significant—as indicated by the 95% bootstrapped confidence interval around the mean ( $CI_{BS} = -0.062$  to 0.305). However, consistent with our expectations, the interaction between mood and bitter taste is significant and in the hypothesized direction: bitter taste increases saving when participants are happy,  $r = 0.294$ ,  $p < 0.001$ , but decreases saving when they are unhappy,  $r = -0.309$ ,  $p < 0.001$ ;  $\chi^2 = 3.87$ ,  $p < 0.001$ . Given that the mean standardized  $r$  for the positive mood condition is 0.294 (95% CI = 0.198, 0.383) and that for the negative mood condition is  $-0.309$  (95% CI =  $-0.452$ ,  $-0.151$ ), we calculated the number of responses required to achieve 80% power, using different combinations of effect sizes across the positive and negative mood conditions. The results (see online material for detailed calculations) showed most conservative sample size is 206. Following this analysis, we collected data from 235 participants in Experiment 3.

In doing so, we investigated an additional implication of our conceptualization. To reiterate, we assume that a bitter taste leads happy participants to apply bitterness-related concept to their future life situations but leads unhappy participants to apply these concepts to their current situation. If this is so, however, directing sad participants' attention to their future life should lead them to apply the concepts to their future life situation instead, and therefore should increase their disposition to save, much as do happy individuals. To investigate this possibility, we asked participants after making an immediate savings decision to imagine having a credit card after graduating from college and to estimate the proportion of their future income they would be likely to charge to the credit card. We expected that in this case, both happy and sad participants would be less likely to spend money after tasting a bitter drink than they would otherwise.

### 5.1. Method

Two hundred thirty-five Chinese college students (60% women,  $M_{age} = 23.02$ ,  $SD = 3.33$ ) participated for a compensation of ¥30 RMB (about \$4.37 USD). They were assigned to conditions of a 2 (mood: happy vs. sad)  $\times$  2 (beverage: bitter tasting water vs. pure water) between-subjects design. (We used Zajecicka spring water, a real product with a bitter taste, rather than bitter melon water as a stimulus.) Twenty participants' responses were deleted (5 did not complete the dependent variable questionnaire and 15 did not pass the manipulation check).

The procedure of Experiment 3 was the same as that of Experiment 2 except for two differences. First, as in Experiment 1, we asked participants to report their specific positive emotions (happy, pleasant, and delighted;  $\alpha = 0.98$ ) and specific negative emotions (sad, unpleasant, and distressed;  $\alpha = 0.95$ ) after the mood manipulation task. Second, we used a different scenario for the savings decision task. After recalling either happy experience or sad experience and tasting either bitter water or pure water, participants completed another questionnaire that was ostensibly designed to examine college students' credit-card-use intentions in the future. In this questionnaire, participants were first asked several questions related to credit card usage (“do you have a credit card?”, “to which bank do you plan to apply for a card?”). Then, participants indicated how much they would like to save if they received ¥500 RMB cash from their credit card company's cash refund promotion. After that, participants were asked to report their agreement that they would save 50% of their income if they had income currently along a scale

from 1 (*totally disagree*) to 7 (*totally agree*). Finally, we asked participants to imagine that they had their own credit card after graduation, and to indicate the maximum percentage of their income they would charge to it. We expected that participants who drank bitter water would save more than who drank pure water and that this effect would not depend on participants' mood.

## 5.2. Results

### 5.2.1. Manipulation check

Our manipulations were successful. Participants felt more positive in happy mood conditions ( $M = 5.91$ ,  $SD = 0.12$ ) than in sad mood conditions ( $M = 3.45$ ,  $SD = 0.13$ ),  $F(1, 210) = 195.67$ ,  $p = 0.000$ ,  $\eta^2 = 0.48$ , one missing data point. Furthermore, they reported having more positive emotions (happy, pleasant, and delighted) in the former condition ( $M = 5.68$ ,  $SD = 0.12$ ) than in the latter ( $M = 2.07$ ,  $SD = 0.13$ ),  $F(1, 209) = 447.27$ ,  $p = 0.000$ ,  $\eta^2 = 0.68$ . However, they reported less negative emotions (sad, unpleasant, and distressed) in the happy mood condition ( $M = 1.71$ ,  $SD = 0.12$ ) than in the negative mood condition ( $M = 4.28$ ,  $SD = 0.13$ ),  $F(1, 209) = 214.30$ ,  $p = 0.000$ ,  $\eta^2 = 0.51$ . However, the beverage that participants tasted did not influence their mood (all  $p$ 's  $> 0.20$ ).

### 5.2.2. The amount of money saved

Analyses of the amount of money participants decided to save as a function of mood and taste conditions yielded a significant interaction of these variables,  $F(1, 211) = 6.68$ ,  $p = 0.010$ ,  $\eta^2 = 0.03$ . Planned comparisons indicated that happy participants decided to save more when they had tasted bitter water ( $M = 240.17$ ,  $SD = 148.27$ ) than when they had tasted pure water ( $M = 191.07$ ,  $SD = 160.14$ ),  $F(1, 211) = 2.86$ ,  $p = 0.088$ . But, sad participants chose to save less in the former condition ( $M = 213.14$ ,  $SD = 170.36$ ) than in the latter ( $M = 275.11$ ,  $SD = 147.87$ ),  $F(1, 211) = 6.68$ ,  $p = 0.052$ .

### 5.2.3. Willingness to save the current income

We asked participants to imagine they have income, and to indicate to what extent they agree/disagree to save 50% of their income. As expected, the results showed a significant two-way interaction effect of mood and taste on participants' agreement to save 50% of current income,  $F(1, 211) = 10.48$ ,  $p = 0.003$ ,  $\eta^2 = 0.05$ . Specifically, happy participants' agreement to save 50% of income was higher after they drank bitter water ( $M = 4.77$ ,  $SD = 2.03$ ) than after they drank pure water ( $M = 3.89$ ,  $SD = 2.06$ ),  $F(1, 211) = 5.48$ ,  $p = 0.020$ . However, sad participants in pure water conditions ( $M = 4.49$ ,  $SD = 2.14$ ) were more likely to agree to save 50% of income than those in bitter conditions were ( $M = 3.57$ ,  $SD = 1.88$ ),  $F(1, 211) = 5.05$ ,  $p = 0.025$ . Therefore, our propositions were supported here.

### 5.2.4. Percentage of credit card spending

Participants were asked to imagine having their own credit card in the future, and to indicate the maximum percentage of their income that they would charge to it. In this case, we expected that sad participants as well as happy participants would apply bitterness-related concepts to future

circumstances and thus would be more likely to save. An analysis of participants estimates of the percentage of their income they would charge yielded a significant effect of taste,  $F(1, 211) = 10.48, p = 0.001, \eta^2 = 0.05$ . And this effect was not contingent on mood (all  $p$ 's  $> 0.75$ ). That is, participants chose to spend less in the future after drinking bitter water ( $M = 38\%, SD = 21\%$ ) than after drinking pure water ( $M = 47\%, SD = 23\%$ ) and this was true regardless of whether they were happy ( $M_{\text{pure-water}} = 48\%, SD = 21\%$  vs.  $M_{\text{bitter-water}} = 38\%, SD = 20\%$ ) or sad ( $M_{\text{pure-water}} = 47\%, SD = 26\%$  vs.  $M_{\text{bitter-water}} = 37\%, SD = 21\%$ ).

### 5.3. Discussion

The results of this study confirmed our expectation that happy individuals tend to apply bitter concepts to their future life and hence are disposed to save whereas sad individuals apply bitter concepts to their current life and are more likely to spend. When sad individuals were explicitly asked to think about future spending decisions, however, sad individuals, like happy ones, spent less when bitterness-related concepts were activated.

## 6. Experiment 4

The preceding three experiments confirmed our assumption that tasting a bitter drink activates thoughts about a bitter life, the immediacy of the possible adversity, and thus their effects on savings decisions depend on whether participants feel happy or unhappy at the time they make these decisions. To provide evidence that these effects are generalizable to conditions outside the laboratory, we conducted two field studies.

### 6.1. Method

Four college students who did not know our research hypotheses but received training on how to approach strangers served as experimenters. They intercepted customers at the entrance of a small-sized chain supermarket in China, and asked them if they would be interested in sampling a new beverage that had recently been put on the market. (The nature of the beverage was not mentioned.) Customers who showed interest in the drink first completed a short questionnaire that assessed their mood along three scales from 1 (*very bad/sad/negative*) to 7 (*very good/happy/positive*). Responses to these items were averaged ( $\alpha = 0.99$ ).

Then, participants were given an opaque cup with a lid, which contained either bitter water (Zajecicka spring water, as used in Experiment 3) or pure water. After tasting the drink, participants indicated the taste of the beverage and the extent to which they like the beverage along a scale from 1 (*not at all*) to 7 (*very much*), and the demographic variables used in previous experiments. Participants entered the supermarket after finishing the questionnaire.

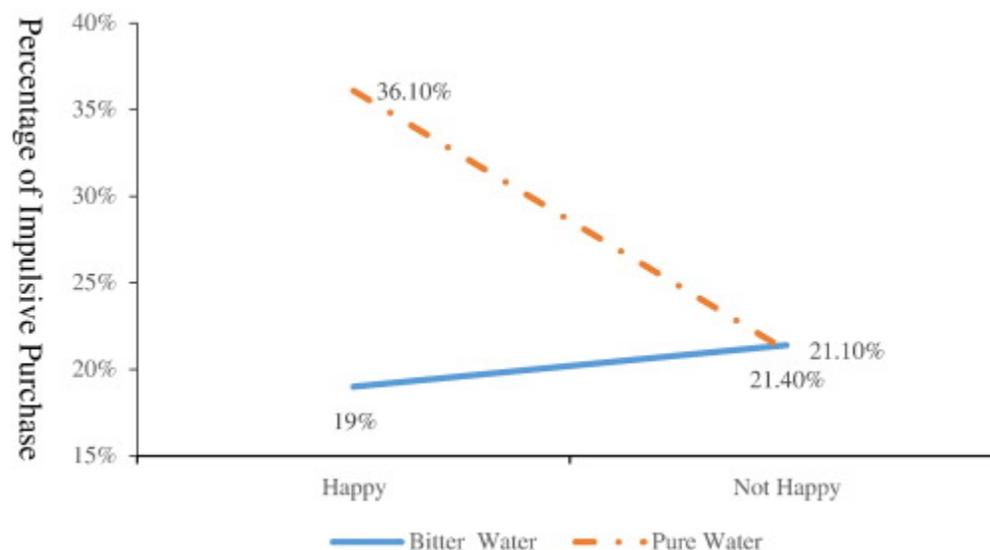
One hundred and twenty-one shoppers who had participated in the blind taste test before shopping were then contacted again upon exiting the supermarket and asked if they would be willing to let the experimenter take a picture of their shopping receipt in exchange for RMB 10 (about \$1.60). Customers who were willing to provide the receipt (5 customers refused to do so) were asked to indicate the item(s) on the receipt that they originally had not planned to buy. In

total, the receipts of 116 customers (64.7% women,  $M_{age} = 43.82$ ,  $SD = 15.87$ ; 61 customers in bitter taste condition) were collected and analyzed.

## 6.2. Results

All 116 participants correctly identified the taste of the beverage. We expected that drinking bitter water would decrease happy consumers' impulsive purchases but increase sad consumers' impulsive purchases. To evaluate this possibility, we used the proportion of money spent on unplanned purchases as the indicator of impulsive spending.

A regression analysis of this proportion as a function of taste conditions, mood, and their interaction term was conducted. The results showed a significant main effect of mood,  $b = 0.13$ ,  $t(112) = 2.68$ ,  $p = 0.008$ ,  $\eta^2 = 0.07$ , indicating that happy participants were more likely to engage in impulsive buying. More important, the interaction of mood and taste was also significant,  $b = -0.07$ ,  $t(112) = -2.39$ ,  $p = 0.018$ . Spotlight analyses, shown in Fig. 2, indicate that when participants were happy (1  $SD$  above the mean), drinking bitter (vs. pure) water significantly decreased their impulsive purchasing (19% vs. 36%). When participants were sad (1  $SD$  below the mean), however, this difference disappeared (21% vs. 21%). This null result could be driven by the fact that participants' mood was actually not very negative ( $M = 5.82$ ).



**Fig. 2.** The percentage of impulsive purchase as a function of mood and taste—Experiment 4.

## 6.3. Follow-up study

Although results of Experiment 4 were consistent with our expectations, participants in that study were generally in a positive mood ( $M = 5.82$  on a seven-points scale). Other research also indicates that people generally feel happy rather than unhappy (Myers, 2000). If this is so, tasting a bitter drink should generally lead individuals to save more, as shown in the laboratory among those in both positive and control conditions. A follow-up field study confirmed this expectation.

Twenty college students, who did not know our research hypotheses but received training about how to approach strangers, served as experimenters. The procedure was the same as that of Experiment 4 with two exceptions. First, we used black coffee instead of Zajecicka spring water as a bitter tasting beverage. Second, customers did not fill in a questionnaire, thereby making the field experiment more realistic. The study was conducted on a pleasant Saturday. (Saturday is the first day of weekend in China, and people are usually more relaxed and happier on that day. Furthermore, that Saturday was a warm spring day, which made it quite pleasant.) In total, sixty-seven shoppers took part in the blind taste test, and 60 customers' receipts (30 in each beverage condition; 7 customers refused to provide their receipt) were collected and analyzed.

As in Experiment 4, we derived the degree of impulsive buying from the ratio of the amount spent on impulsive purchases to the total spending in that store. Consistent with our expectations, the ratio of the amount spent on impulsive purchases to the total amount spent was lower after participants had tasted black coffee ( $M = 8\%$ ) than after they had tasted pure water ( $M = 20\%$ ),  $F(1, 58) = 3.84, p = 0.055, \eta^2 = 0.06$ .

## 7. Experiment 5

Our final experiment confirmed the generalizability of our findings using a different subject population (primary school students) who made actual savings decisions.

### 7.1. Method

Forty-Seven Chinese primary school students (46.8% women) ranging from 10 to 15 years in age ( $M_{age} = 11.78, SD = 2.0$ ) participated this study in exchange for a payment of ¥10 RMB (about \$1.50 USD). Participants took part in the study one at a time. The procedure for administering the blind taste test (bitter melon water vs. pure water) was the same as that in Experiment 2 except that participants were asked to indicate how they felt after taking the beverage along a scale from 1 (*very sad*) to 7 (*very happy*).

Participants then received their payment in ten 1-RMB coins and a piggy bank. They were told that, if they wanted, they could save some of the coins by putting them into that piggy bank and getting their saved money back two weeks later. To avoid social desirability biases, they were told that they would feel free to save or not to save, and that no matter what decisions they would make, their piggy bank would be given back to them two weeks later.

Each participant was left alone to make his or her savings decision. Upon returning, the experimenter asked the participant to indicate how much (s)he had decided to save and then to describe verbally why (s)he chose to save or not. These descriptions were recorded for further analysis. The piggy banks and the money they had saved were then given back to participants as we had promised.

### 7.2. Results

#### 7.2.1. Manipulation check

All participants correctly identified the right taste (bitter or no-special taste) they had tasted.

### 7.2.2. Mood

Participants' mood did not depend on whether they had tasted bitter melon water not ( $M = 4.84$ ,  $SD = 1.14$ ) or not ( $M = 5.18$ ,  $SD = 0.80$ ),  $F(1, 45) = 1.38$ ,  $p = 0.246$ . Furthermore, participants generally felt happy even after tasting the beverage ( $M = 5.0$ ), which was significantly higher than the scale midpoint of 4.0,  $t(45) = 6.86$ ,  $p = 0.001$ . We therefore assumed that tasting the bitter drink would influence savings decisions as did in previous experiments when participants were happy.

### 7.2.3. Amount of money saved

As expected, participants saved more money if they had tasted bitter melon water ( $M = 6.16$ ,  $SD = 3.42$ ) than if they had tasted plain water ( $M = 3.50$ ,  $SD = 3.14$ ),  $F(1, 45) = 7.62$ ,  $p = 0.008$ ,  $\eta^2 = 0.15$ .

### 7.2.4. Precautionary motivation

A local college student who was unaware of the research purpose transcribed participants' oral descriptions of why they chose to save or not to save money. Two undergraduates who were blind to our hypotheses were given the same definition of precautionary motive and the two criteria to differentiate precautionary motive from other motives as used in Experiment 1. The two coders then coded the reasons given by the participants in terms of whether they reflected this motive or not (Yes = 1; No = 0). The inter-coder agreement was 97% ( $Kappa = 0.92$ ,  $p = 0.000$ ), and disagreements were solved through discussion.

As expected, participants were more likely to mention a precautionary motive after tasting bitter melon drink ( $M = 0.36$ ,  $SD = 0.49$ ) than after tasting plain water ( $M = 0.09$ ,  $SD = 0.29$ ),  $F(1, 45) = 5.03$ ,  $p = 0.03$ ,  $\eta^2 = 0.10$ .

## 8. General discussion

Five studies provided converging evidence of the interactive effects of bitter taste and mood on the disposition to spend or save money. Experiment 1 showed that priming semantic concepts associated with a bitter life increased happy participants' disposition to save money but decreased unhappy participants' inclinations to do so. Experiments 2 and 3 showed that actually tasting a bitter drink had a similar effect. Two follow-up field studies found that tasting a bitter beverage can decrease happy consumers' impulsive buying (an indication of their inclination to spend money rather than to save it) in an actual shopping situation. Finally, Experiment 5 showed that drinking bitter beverage can increase happy consumers' real saving behavior.

These findings suggest the important role that mood plays in the effect of taste on consumers' savings decisions. In situations where individuals have not had a negative consumption experience before they make a savings decision, they are less inclined to save money when they are happy than when they are sad. In these conditions, individuals apparently base their decision

on more general implications of their mood without considering any particular time of their life. That is, happy people, who consider their life to be unproblematic (Schwarz et al., 1991) and are generally high in self-esteem (Levine et al., 1994), are inclined to spend money without considering the consequences of doing so, whereas unhappy individuals, who see life as potentially more threatening, are more cautious and thus inclined to save.

After drinking an unpleasant beverage, however, these dispositions change. Drinking a bitter beverage activates concepts of bitterness and the accessibility of these concepts in memory at the time participants make a savings decision leads them to think more specifically about the implications of their decision for their life. In this case, happy individuals, who feel that their present situation is benign, are likely to apply these concepts to their future life and consequently are likely to decide to save. In contrast, unhappy people may apply bitterness-related concepts to their current life circumstances and may be motivated to spend money to improve their immediate situation.

A second consideration arises. The effect of a bitter-tasting drink on happy individuals' savings decisions is caused by its effects on the semantic concepts that are activated by the drink on their interpretation of their future life. Consequently, the effects do not generalize to unpleasant beverages that do not activate these concepts. However, the effects of tasting a bitter drink on sad individuals' savings decisions are generalizable to salty drinks as well. This suggests that an additional factor contributes to persons' decisions in this situation, namely, their motivation to reduce the negative feelings they are experiencing in the immediate situation. Thus, although drinking a salty beverage was not relevant to the interpretation of their current life circumstances, it nevertheless called attention to the aversiveness of their immediate situation and motivated them to eliminate this aversiveness by spending.

### 8.1. Other considerations

Other research provides evidence that bodily sensations can influence judgments through their mediating impact on the activation of semantic concepts that are metaphorically related to these sensations (Lee and Schwarz, 2012, Williams and Bargh, 2008, Zhang and Li, 2012). However, our research is among the first to show that the impact of bodily sensations can be influenced by other subjective reactions (e.g., affect) that individuals experience simultaneously (see also Centerbar & Centerbar & Clore, 2006). Moreover, these reactions not only influence the conditions to which the concepts activated by bodily sensations are applied but also influence how they are applied.

The similar effect of tasting a bitter drink and activating bitterness-related semantic concepts is of more general interest. Many previous studies have demonstrated the effect of bodily sensations on behavior (for a review, see Landau et al., 2010). However, only a few (e.g., Zhang & Li, 2012) have shown that semantic concepts and the feelings that elicit these concepts have the same effect on judgments and behavior. In the present research, the semantic concepts that were activated did not have a direct impact on decisions. Rather, their effect was mediated by the influence of these concepts on individuals' precautionary motives.

Previous research has painted a mixed picture of how individuals' affective state affects their saving behavior. Some researchers (e.g. Andrade, 2005) argue that negative affect leads people to be prudent in their financial decisions, whereas positive affect signals security and stimulates consumer spending. In contrast, others suggest that negative affect increases impulsive buying (Isen, 1984, Scherhorn et al., 1990). Our research reconciles these findings. Experiments 2 and 3 suggest that without the activation of concepts associated with a bitter life, a happy mood is likely to increase spending, whereas a sad mood is likely to decrease it. (This was also evident in Experiment 1, although the difference was not significant.) When these concepts are activated, however, the effect of people's mood depends on whether their attention is focused on their future life situation or their current life circumstances.

The evidence that individuals' savings decisions are influenced by objectively unrelated experiences is of general importance. Most past research has focused on cultural factors (Briley & Aaker, 2006), personal traits such as impulsiveness (Puri, 1996), lack of self-control (Thaler & Benartzi, 2004), and temporal orientation (Howlett, Kees, & Kemp, 2008) that have implications for why people don't save. With few exceptions (Laran, Dalton, & Andrade, 2011), however, little attention is paid to situational factors. Our research testifies to the importance of these factors. The finding that tasting a bitter drink can affect participants' impulsive purchases in an actual shopping situation is particularly noteworthy. This suggests that incidental stimuli that consumers encounter in the course of shopping can fortuitously affect their willingness to spend (or save) money. Furthermore, this effect holds in two different cultures and in both lab experiments and real shopping situations.

## 8.2. Limitations

Although our research provides strong support for the role of bitter taste in savings decisions, it is not without limitations. In an effort to minimize potential confounds, we did not tell the participants what the beverage was made from or show them the color of the drink. It is conceivable that providing individuals with prior knowledge of the drink they will taste would diminish the effect of its bitter taste. For example, knowing about the benefits of bitter melon (e.g., lowering blood sugar and glucose) might change individuals' focus from taste to health, thereby decreasing the likelihood of activating precautionary motives. Besides, a bitter taste might also have less effect on the behavior of individuals who are used to the taste of bitterness. Finally, the money that participants imagined spending or saving in our studies was received unexpectedly. The effect of bitter taste on regular savings decisions may be less evident. Future research could investigate this possibility.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at <http://dx.doi.org/10.1016/j.jesp.2016.12.010>.

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