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Journal of Consumer Psychology xx, x (2014) xxx–xxx



## Better moods for better eating?: How mood influences food choice

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Received 7 February 2011; received in revised form 10 January 2014; accepted 17 January 2014

### Abstract

How do moods influence one's preference for foods? By introducing the role of enjoyment- versus health-oriented benefits of foods in the mood and food consumption relationship, this research informs both temporal construal theory and mood management framework by positing that mood influences the choice between healthy versus indulgent foods through its impact on temporal construal, which alters the weights people put on long-term health benefits versus short-term mood management benefits when making choices. The results from four experiments show that a positive mood cues distal, abstract construal and increases the salience of long-term goals such as health, leading to greater preference for healthy foods over indulgent foods. The results also show that a negative mood cues proximal construal and increases the salience of immediate, concrete goals such as mood management, leading to greater preference for indulgent foods over healthy foods.

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*Keywords:* Mood; Well-being; Mood management; Temporal construal; Healthy eating

### Introduction

There is more to food than just nutrition. Past research has found that food intake is associated with an individual's affective states (Arnou, Kenardy, & Agras, 1995; Macht, 2008). Many people eat in order to distract themselves from, compensate for, or cope with negative affects such as stress, anxiety, frustration, fear, daily hassles, sadness, boredom, depression, and fatigue (Chua, Touyz, & Hill, 2004; O'Connor, Jones, Conner, McMillan, & Ferguson, 2008; Polivy & Herman, 1999; Schachter, Goldman, & Gordon, 1968; Wallis & Hetherington, 2004, 2009; Willner et al., 1998). The foods eaten under these circumstances are sometimes referred to as comfort foods, and most of these foods are indulgent, sweet, carbohydrate- and fat-rich foods because such foods can provide immediate satisfaction and even psycho-physical benefits. For

example, foods with high levels of fat and sugar trigger the release of insulin and endorphins (Benton & Owens, 1993; Gold, MacLeod, Frier, & Deary, 1995), and intragastric infusion of fatty acid solution affects brain activity in multiple regions in people with sadness (Van Oudenhove et al., 2011).

Similarly, studies have found that positive emotions are often associated with high appetite levels (Mehrabian & Riccioni, 1986), particularly for familiar foods (Mela, 2001), because happy individuals seek out foods in order to celebrate or reward themselves (Rozin, 1982; Rozin & Tuorila, 1993). Likewise, research has shown that joy (Macht, Roth, & Ellgring, 2002) and positive mood accompanied by strong emotional arousal (Cools, Schotte, & McNally, 1992) increase the consumption of indulgent foods such as chocolate and buttered, salted popcorn.

However, more recent studies showed that negative moods and positive moods may lead to preference for different types of foods. For example, Garg, Wansink, and Inman (2007) found that people ate more of a hedonic food when they were sad, and more of a less-hedonic food when they were happy. Fedorikhin and Patrick (2010) also showed that, given a choice

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between chocolate candies and grapes, individuals in a positive mood were more likely to eat grapes than those in a neutral mood.

A few studies offer insights into why positive moods are associated with preference for such diverse foods, based on the affect regulation framework (Gross, 1998; Wegener & Petty, 1994). For example, Andrade (2005) found that a positive mood increased one's willingness to try an indulgent food (i.e., chocolates) when a mood-lifting cue was present but decreased willingness to try a healthy food (i.e., coconut water) when a mood-threatening cue was present. When no mood-changing cue was present, however, a positive mood increased willingness to try both chocolate and coconut water compared to a neutral mood. Similarly, Labroo and Mukhopadhyay (2009) showed that people in a positive mood chose nutritious foods when they did not feel the need for mood maintaining behaviors, but chose indulgent foods when they felt the need for mood maintaining behaviors.

However, these studies were limited in that the affect regulation motive for choosing healthy or indulgent foods was experimentally given to participants as lay theories about the nature of moods or explicit cues about mood-changing consequences associated with consuming the target foods. Moreover, although some researchers have interpreted the finding that people in a positive mood prefer healthy foods to indulgent foods as an indication of people in a positive mood acting in their long-term interests like health (Fedorikhin & Patrick, 2010; Labroo & Mukhopadhyay, 2009), the relationships between mood, affect regulation, temporal perspective, and food choice have not been empirically tested in a comprehensive manner. The present work extends past research on mood and food consumption by marrying the affect regulation framework with a temporal construal theory explanation to enhance our understanding of the process underlying the effects of mood on preference for healthy or indulgent foods. In particular, four laboratory experiments test the hypotheses that individuals in a positive mood will prefer healthy foods to indulgent food for long-term health or well-being benefits and those in a negative mood will prefer indulgent foods to healthy foods for immediate, hedonistic, mood management benefits.

## Theoretical background

### *Affect congruency and food consumption*

An individual's affective state often guides attention to information consistent with the valence and quality of his or her affective states (for a review see Berkowitz, 2000, pp. 78–83). Adaval (2001), for example, indicates that an individual tends to put greater weight on affect-consistent product information particularly when his or her product evaluations are made on the basis of hedonic rather than utilitarian criteria. The affective congruency hypothesis suggests that, when evaluating indulgent foods (e.g., chocolates), positive moods enhance attention to affect-consistent, favorable attributes such as sweet taste and diminish attention to affect-inconsistent, unfavorable attributes

such as high fat content and expensive price. On the other hand, however, the opposite will be the case for negative moods.

Therefore, the affect congruency hypothesis suggests that relative to neutral mood, positive mood leads to more favorable evaluations and increased consumption while negative mood leads to less favorable evaluations and decreased consumption. Consistent with this hypothesis, Cools et al. (1992) found that a positive mood accompanied by strong arousal increased the consumption of snack foods. Similarly, several studies have found that joy increased an individual's willingness to eat indulgent snack foods whereas sadness decreased the perceived pleasantness of and willingness to eat the same snack foods (Baucom & Aiken, 1981; Macht et al., 2002; Willner & Healy, 1994). Andrade (2005) also found that willingness to try both chocolate (which can be viewed as indulgent) and coconut water (which can be viewed as healthy) increased in an affect-congruent manner in the absence of a mood-changing cue.

### *Affect regulation and food consumption*

The hedonic contingency or affect regulation hypothesis (Gross, 1998; Wegener & Petty, 1994) provides additional insights into the relationship between mood and consumption, and it predicts a different relationship. Wegener and Petty's (1994) hedonic contingency hypothesis suggests that individuals process information in such ways that processing of the information either maintains a favorable mood or improves an unfavorable mood. Extending this reasoning to mood and food consumption relationships, one would predict that people will prefer foods that can help repair a negative mood or maintain a positive mood but avoid foods that may disrupt a positive mood or aggravate a negative mood.

In support of this prediction, Andrade (2005) showed that individuals in a positive mood were less willing to try coconut water, a healthy food, if mood-threatening consequences of consumption were cued and that individuals in a negative mood were more willing to try chocolate, an indulgent food, if mood-lifting consequences of consumption were cued. Similarly, Labroo and Mukhopadhyay (2009) showed that people in a positive mood chose indulgent foods when they believed their mood to be fleeting and so, inferred a need for mood maintaining action, but chose healthy foods when they believed their mood to be lasting and so, inferred no need for mood maintaining action.

### *Affect regulation-temporal construal hypothesis*

Although the research cited provides support for the role of affect regulation in the effects of mood on food choices under some conditions, it does not address the mood-threatening consequences of consuming indulgent foods for those in a negative mood or the mood-threatening consequences of consuming healthy foods for those in a positive mood. In fact, consuming indulgent foods often has undesirable long-run physical and affective consequences, including reactive hypoglycemia (or glucose crash), regret, guilt, or depression (Larsen, 2000; Thayer, 1987, 1996). If people are aware of this vicious

cycle, then people in a negative mood may also be motivated to avoid indulgent foods for the sake of affect regulation in the long-run. Likewise, consuming healthy foods is often associated with negative affective consequences resulting from unsavory tastes or unpleasant mouth-feel associated with such foods. Therefore, people in a positive mood may also be motivated to avoid healthy foods for the sake of maintaining their positive moods in the short-run.

Then, why do people in a positive mood prefer healthy foods despite their immediate mood-threatening potential, and why do people in a negative mood prefer indulgent foods despite their long-run mood-threatening potential? The affect regulation hypothesis alone does not provide a clear answer to these questions. However, introducing the concept of temporal construal into the picture can provide better insights. In fact, Labroo and Mukhopadhyay (2009) interpreted their finding that individuals in a positive mood who believed that their moods would last and so had no need to manage their moods chose nutritious foods because they were behaving in their long-term interests (i.e., being healthy) (p. 246). Similarly, Fedorikhin and Patrick (2010) found that, compared to people in a neutral mood, those in a positive mood were more likely to choose a nutritious food over an indulgent one and that when they did choose an indulgent food they ate less of it. Taken together, this research suggests that people in a positive mood make food choices putting more weight on long-term health consequences while people in a negative mood make food choices putting more weight on short-term mood consequences of the foods, but it does not answer the question why.

We hypothesize that this effect is, at least in part, due to positive mood triggering distal temporal construal and negative mood triggering proximal temporal construal. Relative to individuals in a less positive mood, those in a more positive mood, tend to regulate their behaviors in order to attain future well-being (Aspinwall, 1998). Labroo and Patrick (2009) posited that positive mood, by signaling that the immediate environment is benign, encourages a more long term perspective; while negative mood, by signaling an imminent problem, encourages a focus on the immediate. They empirically showed that individuals' moods affect the time perspective they adopt in order to make decisions by demonstrating that individuals in a negative mood tend to take a more proximal perspective, exhibiting greater preferences for products when their immediate benefits are emphasized (e.g., drink orange juice to "ensure your health today"), whereas individuals in a positive mood tend to adopt a more distal perspective, exhibiting greater preferences for products when their long-term benefits are highlighted (e.g., drink orange juice to "invest in your future health").

Temporal construal level theory indicates that people put more weight on primary, abstract, higher-level interests when they make decisions with a distal perspective but more weight on secondary, concrete, lower-level interests when they make decisions with a proximal perspective (Fujita, Trope, Liberman, & Levin-Sagi, 2006; Liberman, Sagristano, & Trope, 2002; Liberman & Trope, 1998; Trope & Liberman, 2000). For example, Trope and Liberman (2000) showed that individuals

who were looking for a work-study position in the distant future preferred an attractive job with uninteresting training to an unattractive job with interesting training because they compared the work study alternatives with a higher-level abstract construal which puts more weight on the job than on the training. They conceptualize high-level construal as relating "to the significance of the event, its importance and meaning, its implications for one's overall goals and personality and its broad consequences" and low-level construal as relating "to the concrete details of the event, the unfolding of the event, and its context (the places, objects, and people involved, the sounds smells and sights)" (p. 879).

If individuals in a positive mood tend to take a distal perspective and, thus, adopt an abstract, higher-level construal of food choices, we can anticipate that they will put more weight on abstract, long-term benefits which are related to overall goals—like health and well-being—than on concrete, short-term benefits which are related to the unfolding of the event—like taste and immediate hedonic sensations. Therefore, people in a positive mood are likely to prefer healthy foods to indulgent foods for their long-term health and well-being benefits despite their immediate mood-threatening potentials like less enjoyable tastes. On the other hand, if individuals in a negative mood tend to take a proximal perspective, and, thus, adopt a concrete, lower-level construal of food choices, we can anticipate that they will put more weight on concrete, short-term benefits than on abstract, long-term benefits. Therefore, people in a negative mood are likely to prefer indulgent foods to healthy foods for their immediate mood-lifting consequences like enjoyable tastes and momentary mood boosts despite their long-term health hazards or the feelings of regret or guilt that may come later. Therefore, by integrating temporal construal theory with the affect regulation framework in the domain of food consumption, we hypothesize:

**H1.** When making a choice between indulgent or healthy foods, a positive mood will lead to more distal construal, i.e., greater consideration of long term or abstract goals, which will lead to greater preference for healthy foods than indulgent foods.

**H2.** When making a choice between indulgent and healthy foods, a negative mood will lead to more proximal construal, i.e., greater consideration of short term or concrete goals, which will lead to greater preference for indulgent foods than healthy foods.

#### *Study 1: positive mood and food evaluations*

Study 1 investigates the effect of a positive mood (vs. control group) on evaluations of indulgent foods and healthy foods. Drawing on the effects of affect on temporal construal we expect that individuals in a positive mood, compared to those in a neutral mood, will evaluate healthy foods more positively than indulgent foods because they will place greater weight on abstract, higher-level benefits—e.g., health, nutrition, and future well-being—than on concrete, lower-level benefits—e.g., taste, sensory experience, and immediate mood benefits.

## Method

### Participants and design

Two-hundred and eleven participants were recruited through eight local Parent-Teacher Associations (PTAs) in exchange for a donation of \$6.50 made to the respective PTA for each participant. Of these participants, 151 were between the ages of 30 and 45, and 60 were the primary meal planners in their families. The current experiment adopted a 2 (mood: positive vs. control group)  $\times$  2 (food type: indulgent vs. healthy foods) between-subjects design with three product replicates to enhance generalizability. Indulgent foods and healthy foods were selected in pairs to ensure that usage occasion was not confounded with the food type manipulation. The three pairs of foods were selected through a pretest which involved a separate sample of 31 PTA members who participated in exchange for a \$150 donation to their PTA.

Twenty-two food items were pre-selected for pre-testing and participants were asked when (mid-morning snack, lunch, and mid-afternoon snack), how often, and why they ate them. Based on the results of the pretest, three pairs of foods that were similar to each other in terms of typical usage situations were selected. The three pairs of foods chosen were granola bars/candy bars, apples/cookies, and rice cakes/potato chips. These product pairs were further validated with another sample of 194 participants who rated each of the six target foods on four 9-point Likert scale items regarding the following product attributes: "I eat it just because it tastes good (taste dimension)," "I enjoy the experience of eating it (sensory experience dimension)," "I eat it because it is good for my health (health dimension)," and "I eat it because I believe it is nutritious (nutrition dimension)." As shown in Table 1, candy bars, potato chips, and cookies scored higher on the concrete, lower-level attributes such as taste and sensory experience whereas granola bars, rice cakes, and apples were rated higher on the abstract, higher-level attributes such as healthfulness and nutrition.

### Procedure and measures

Participants gathered in groups of 7 to 38 at the respective schools where their PTAs met regularly. Upon arrival,

participants were asked to take every other seat and they were given a closed packet of materials containing a cover sheet of instructions and several consecutively numbered booklets. When initially recruited, our participants were told that they were going to answer a variety of questions on issues ranging from home economics to how they spent their leisure time. This cover story was reasserted at the beginning of the study, and the debriefing at the end of the study showed that it was successful. All but two participants believed the study was related to how they spent their time with their family, and the responses by the two participants who correctly guessed the purpose of the main study were excluded from subsequent analyses.

Participants were also told that the study was partly sponsored by a state-level grant in order to help defray the costs of the study. Next, participants' mood was manipulated. To induce a positive mood, we asked one group of participants to read a positive story purportedly taken from *Reader's Digest*. The positive story was selected based on the general tone and conclusions (Gardner & Wilhelm, 1987), and the gender of the main character was changed to be male or female to correspond to the gender of each participant. The story was four pages long and contained a focal character who ended up being very successful in her/his endeavors. While participants in the positive mood condition were asked to read the story and to empathize with the character, those in the control group condition were asked to read a valence-free story related to travel. Both groups of participants were then asked to complete the following six 9-point semantic differential items to assess their mood states: "I feel edgy or irritable," "I feel happy," "I am not very comfortable right now," "I feel sad," "I feel cheerful," and "I am in a good mood." These six items were averaged to form a reliable mood manipulation check index ( $\alpha = .94$ ).

Following the mood manipulation booklet, participants were instructed to move on to the home economics portion of the study. This booklet was separate and of a different color and font because it was important that their mood would persist without them thinking that the two booklets were connected. Toward this end, participants were provided with simple print ads that presented only the brand names and logos for hypothetical brands of the target products. Minimal information was provided because extensive processing of complex messages could interfere with participants' induced mood states.

Table 1  
A pretest comparison between food pairs for Study 1.

Items	Bars			Common counter snacks			Bagged snacks		
	Candy bar	Granola bar	<i>t</i> -stats	Cookies	Apples	<i>t</i> -stats	Potato chips	Rice cakes	<i>t</i> -stats
I eat it just because it tastes good	7.3 (1.8)	6.5 (2.2)	4.7**	7.6 (1.7)	6.6 (2.2)	5.4**	6.9 (2.1)	3.5 (2.5)	14.4**
I enjoy the experience of eating it	6.0 (2.3)	5.0* (2.8)	6.1**	6.3 (2.1)	5.5 (2.3)	3.5**	5.6 (2.5)	3.1 (2.2)	11.5**
I eat it because I believe it is nutritious	3.5 (2.8)	5.7 (2.5)	-10.4**	3.7 (2.7)	6.8 (2.3)	-12.7**	3.8 (2.8)	4.8 (3.0)	-4.0**
I eat it because it is good for my health	1.9 (1.7)	6.1 (2.2)	-20.6**	2.2 (1.6)	7.4 (1.8)	-26.9**	2.1 (1.5)	5.0 (2.9)	-11.8**

Note. Numbers in the parentheses are standard deviations.

\*  $p < .05$ .

\*\*  $p < .01$ .

Each booklet contained the print ads for either the three indulgent target foods (candy bars, potato chips, and cookies) or the three healthy target foods (granola bars, rice cakes, and apples). Presentation order across the three target foods was randomized and had no effects. After each ad was presented, participants evaluated the target foods on four 9-point bipolar items: “bad–good,” “unappealing–appealing,” “like–dislike,” “unlikely–likely to eat in the next two weeks.” These items were averaged to form a reliable food evaluation index ( $\alpha = .88$ ). Finally, participants rated the perceived healthfulness and tastiness of the target foods, and reported the extent to which they were trying to stay healthy for their old age on a 9-point Likert scale.

## Results

### Manipulation checks

Table 2a shows the means of the manipulation checks. A 2 (mood)  $\times$  2 (food type) ANOVA indicated a significant main effect for the mood manipulation index ( $F(1, 205) = 13.36, p < .001$ ), such that participants who read the happy story ( $M = 6.2$ ) reported that their moods were more positive than control group participants ( $M = 5.5$ ). A second 2 (mood)  $\times$  2 (food type) ANOVA revealed a significant food type main effect on perceived healthfulness ( $F(1, 205) = 345.03, p < .001$ ), indicating that

participants perceived the nutritious target foods ( $M = 6.8$ ) to be more healthful than the indulgent foods ( $M = 2.5$ ). In contrast, a third 2 (mood)  $\times$  2 (food type) ANOVA yielded a significant food type main effect on perceived tastiness ( $F(1, 205) = 22.35, p < .001$ ), such that participants perceived the indulgent foods ( $M = 6.7$ ) to be tastier than the nutritious foods ( $M = 5.1$ ). No other significant effects were found for the manipulation checks.

### Hypothesis testing

To test our hypotheses, we conducted a 2 (mood)  $\times$  2 (food type) ANOVA on the food evaluation index (see Fig. 1). The data were aggregated across the three target food pairs for subsequent statistical analyses because a main effect of food type ( $F(1, 197) = 2.08, p = .13$ ), a food type–food pairs interaction ( $F(1, 197) = 1.70, p = .19$ ), a mood–food pairs interaction ( $F(1, 197) = 2.01, p = .14$ ), and a three-way interaction ( $F(1, 197) = .35, p = .70$ ) were not significant. The analysis first yielded a significant main effect of mood such that participants in a positive mood ( $M = 5.2$ ) evaluated the target foods more positively than control group participants ( $M = 4.7; F(1, 205) = 6.52, p < .05$ ). More importantly, the analysis revealed a significant interaction between mood and food type factors ( $F(1, 205) = 51.01, p < .001$ ). Further analysis of the interaction effect indicated that participants in a positive mood ( $M = 6.1$ ) evaluated the healthy foods more

Table 2  
Treatment means and standard deviations (in parentheses) from Study 1 and Study 2.

	Means				ANOVA		
	Control group		Positive mood		F-stats		
	Indulgent foods	Nutritious foods	Indulgent foods	Nutritious foods	p-values		
				Mood	Food type	Mood $\times$ food type	
<i>a) Study 1</i>							
Mood	5.40 (1.16)	5.60 (1.39)	6.20 (1.09)	6.10 (1.31)	13.36 *** .000	.15 .699	.47 .494
Healthy	2.60 (1.73)	6.70 (1.68)	2.40 (1.71)	6.90 (1.39)	.01 .920	345.03 *** .000	.85 .358
Tasty	6.80 (2.16)	4.90 (2.53)	6.60 (2.45)	5.30 (2.66)	.14 .709	22.35 *** .000	.73 .394
Staying healthy	6.20 (2.28)	6.10 (2.06)	7.20 (2.00)	6.70 (1.87)	7.09 ** .008	1.25 .265	.58 .447
Food evaluation	5.50 (1.74)	3.60 (1.72)	4.30 (2.05)	6.10 (1.65)	6.52 * .011	.09 .764	51.01 *** .000
<i>b) Study 2</i>							
Mood	4.60 (1.26)	4.50 (1.15)	6.30 (1.84)	6.10 (1.63)	95.32 *** .000	.72 .397	.26 .610
Healthy	5.50 (2.52)	6.40 (2.52)	5.40 (2.56)	6.40 (2.58)	.04 .842	10.87 ** .001	.13 .719
Tasty	7.30 (2.02)	6.00 (2.62)	7.30 (2.10)	5.70 (2.79)	.43 .512	27.29 *** .000	.26 .610
Staying healthy	3.40 (2.53)	3.60 (2.36)	4.40 (2.76)	4.20 (2.36)	8.18 ** .005	.02 .888	.29 .591
Food evaluation	6.00 (2.34)	5.30 (1.91)	5.20 (2.51)	6.00 (2.07)	.01 .920	.06 .807	9.64 ** .002

\*\*\*  $p < .001$ .

\*\*  $p < .01$ .

\*  $p < .05$ .

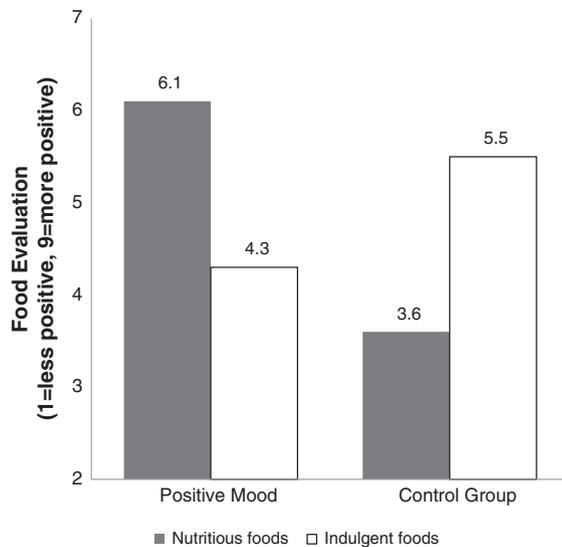


Fig. 1. Effect of positive mood versus control mood on food evaluations (Study 1).

favorably than the indulgent foods ( $M = 4.3$ ;  $F(1, 205) = 25.33$ ,  $p < .001$ ) whereas control group participants liked the indulgent foods ( $M = 5.5$ ) more than the healthy foods ( $M = 3.6$ ;  $F(1, 205) = 25.73$ ,  $p < .001$ ).

In addition, a 2 (mood)  $\times$  2 (food type) ANOVA yielded only a significant main effect for the mood manipulation ( $F(1, 205) = 7.09$ ,  $p < .01$ ), such that participants in a positive mood ( $M = 6.9$ ) were more likely than control group participants ( $M = 6.2$ ) to indicate that they try to stay healthy for their old age (see Table 2a). The interaction of mood and food type was not significant ( $F(1, 205) = .58$ ,  $p = .447$ ), indicating that the effect of mood on participants' future health-orientation was robust across food conditions.

## Discussion

The findings of Study 1 provide empirical support for our prediction that individuals in a positive mood (compared to control group participants in a relatively neutral mood) evaluate healthy foods more favorably than indulgent foods, possibly because they put more weight on abstract, higher-level benefits — e.g., health and future well-being. A remaining question is whether individuals in a negative mood will act differently from those in a positive mood. This is examined in Study 2.

### Study 2: effect of positive versus negative mood on food evaluations

Study 2 primarily investigates the differential effects of a positive mood and a negative mood on evaluations of indulgent and healthy foods. In addition, the current experiment tests the remaining part of the research hypotheses that individuals in a negative mood evaluate indulgent foods more positively than healthy foods possibly because they adopt a proximal perspective which puts more weight on immediate concrete rewards (e.g., taste) than on abstract, long-term benefits (e.g., healthfulness) of foods.

## Method

A total of 315 undergraduate students recruited from a large mid-western university participated in the current experiment as a partial requirement for course credit. Out of the 315 participants, three did not complete the entire questionnaire, and so were removed from the subsequent data analysis. The current experiment adopted a 2 (mood: positive vs. negative mood)  $\times$  2 (food type: indulgent vs. healthy foods) between-subjects design with three product replicates. The experimental procedure and measures used in the current experiment were identical to those in Study 1, except that both positive and negative moods were induced in the current study.

Two basic stories—one positive (happy) and one negative (sad)—were used to manipulate participants' moods. The stories were taken from *Reader's Digest*, edited to be the same length, and pretested on a sample of 57 students using Peterson and Sauber's (1983) mood scale. Each story was four pages long and contained a focal character. In the positive story, the focal character ended up being very successful in his/her endeavors. In the negative story, the focal character died tragically after a lifetime of struggle. The gender of the main character was either male or female to correspond to the gender of each participant. After reading the story, participants were presented with the same ads as in Study 1 and were asked to complete the identical six 9-point semantic differential items used in the previous experiment to assess their mood states ( $\alpha = .91$ ).

## Results

### Manipulation checks

Table 2b shows the means of the manipulation checks. A 2 (mood)  $\times$  2 (food type) ANOVA revealed a significant main effect for the mood manipulation ( $F(1, 308) = 95.32$ ,  $p < .001$ ), such that participants who read the happy story ( $M = 6.2$ ) reported that they were in a more positive mood than those who read the sad story ( $M = 4.5$ ). Although participants in the negative mood condition did not indicate strong negative mood, their average mood was lower than the average mood reported by participants in the control group in the previous study ( $M = 5.5$ ). Considering that individuals generally would like to be in a slightly positive mood (Isen, 1984), our mood manipulations were considered successful in inducing positive and negative mood states. No other significant effects were found for the mood manipulation check, indicating that the mood manipulation was consistent across food type conditions.

A second 2 (mood)  $\times$  2 (food type) ANOVA yielded a significant main effect of food type on perceived healthfulness ( $F(1, 308) = 10.87$ ,  $p < .005$ ), such that participants perceived the healthy foods ( $M = 6.4$ ) to be more healthful than the indulgent foods ( $M = 5.4$ ). In contrast, a third 2 (mood)  $\times$  2 (food type) ANOVA found a significant main effect of food type on perceived tastiness ( $F(1, 308) = 27.29$ ,  $p < .001$ ), indicating that participants perceived the indulgent foods ( $M = 7.3$ ) to be tastier than the healthy foods ( $M = 5.9$ ). No other significant effects were found for either of the food type

manipulation checks, indicating they were consistent across mood conditions.

### Hypothesis testing

A 2 (mood)  $\times$  2 (food type) ANOVA was conducted on the food evaluation index of the target foods ( $\alpha = .88$ ). Again, the data was pooled across three food pairs because our preliminary analyses found no significant differences across the three consumption situations (see Fig. 2).

The analysis yielded a significant mood-food type interaction ( $F(1, 308) = 9.64, p < .005$ ). The analysis of simple effects showed that participants in a positive mood evaluated the healthy foods ( $M = 6.0$ ) more favorably than the indulgent foods ( $M = 5.2; F(1, 308) = 5.73, p < .05$ ) whereas those in a negative mood evaluated the indulgent foods ( $M = 6.0$ ) more positively than the healthy foods ( $M = 5.3; F(1, 308) = 4.00, p < .05$ ). No other significant effects were found for the evaluation of foods.

In addition, a 2 (mood)  $\times$  2 (food type) ANOVA yielded a significant main effect for the mood manipulation ( $F(1, 308) = 8.18, p < .005$ ), such that participants in a positive mood ( $M = 4.3$ ) were more likely than those in a negative mood to try to stay healthy for their old age ( $M = 3.5$ ). No other significant effects were found for trying to stay healthy for one's old age.

### Discussion

Study 2 replicated the directional effect of a positive mood on food evaluations observed in the previous study, providing further support for the hypotheses that individuals in a negative (positive) mood like indulgent foods more (less) than healthy foods. In addition, the findings that those in a positive mood were more likely than those in a neutral or a negative mood to indicate that they try to stay healthy for their old age are consistent with the temporal construal explanation proposed in this work. This process will be explored more fully in Study 3. In addition, the

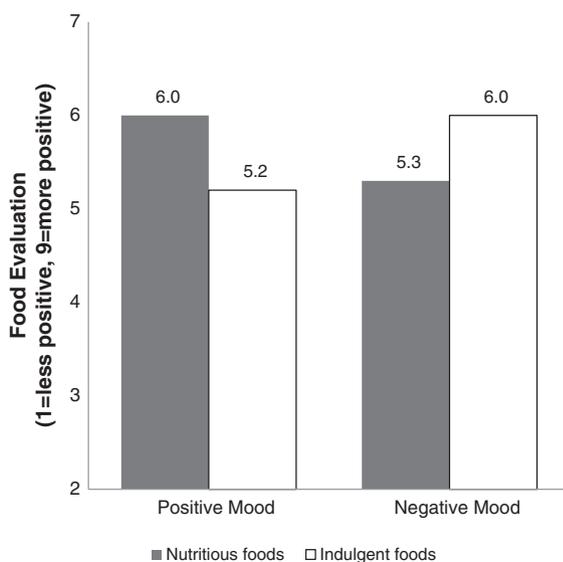


Fig. 2. Effect of positive mood versus negative mood on food evaluations (Study 2).

mood manipulations used in Studies 1 and 2 involved stories related to goal achievement. To eliminate goal achievement as a possible explanation for the findings, a mood manipulation unrelated to goal achievement will be used in Study 3.

### Study 3: effects of mood and temporal construal on food consumption

The findings of Study 1 and Study 2 supported the role of temporal construal in explaining the effects of mood on evaluations of indulgent and healthy foods. The objective of Study 3 is to provide further insight into how this process works. If a negative mood leads to preference for indulgent foods because it evokes proximal, present-focused construal which focuses on immediate pleasure such as improved mood, priming people in a negative mood with future-focused temporal construal should moderate the effect. Similarly, if a positive mood leads to preference for healthy foods because it evokes distal, future-focused construal which focuses on long-term benefits such as health, priming people in a positive mood with present-focused temporal construal should also moderate the effect. To test the mediating relationship better, Study 3 manipulated participants' temporal construal (present- vs. future-focused), along with their mood, and measured how much indulgent food (M&M's) and healthy food (raisins) participants consumed.

### Method

#### Participants and design

A total of 151 undergraduate students recruited from two universities participated in sessions run between 3 p.m. and 7 p.m. An experiment with a 2 (mood: positive vs. negative mood)  $\times$  2 (temporal construal: present-focus vs. future-focus) between-subjects design was conducted.

#### Procedure

Participants sat in separate rooms or cubicles to minimize the likelihood they would see each other to avoid self-consciousness affecting food consumption. Our research participants were told that they were participating in two unrelated studies, presented in two separate envelopes, which were being run in the same session to make efficient use of time. Mood was manipulated using the emotion priming method (Garg et al., 2007). The mood manipulation task was disguised as a survey of the things and events that can be potentially used to induce various emotional responses in advertisements for products. Participants were first asked to describe three to four things (objects, persons, animals, places, etc.) that make them feel happy (vs. sad) in as much detail as they can. Then, they were asked to describe the one event in their lives that made them feel happiest (vs. saddest) as vividly as possible so that someone reading the story would experience the same feelings. We note that this manipulation is unrelated to goal pursuit.

After participants finished the tasks, their moods were assessed. Then participants were given two plates of snacks. A

full-plate of M&M's weighed approximately 45 g, and a full-plate of raisins weighed approximately 42 g. Participants were told that the snacks were tokens of appreciation for their participation given the time of day and that they were welcome to eat the snacks as they would like while completing the rest of their tasks. Then they were instructed to proceed with the second study which they were told was unrelated to the first study.

The second study began with the temporal construal manipulation. The method used by Rabinovich, Morton, and Postmes (2010) was adapted to manipulate participants' time perspectives directly while avoiding confounding with any food-consumption-related concepts (e.g., healthy vs. indulgent) or level of construal (abstract vs. concrete). To evoke present-focused temporal construal, participants were asked to think about what their current residence is like and answer a series of questions about its type (a house, a dorm, an apartment, etc.), rooms, facilities or amenities, neighbors, decorations, and the three most valuable things they have at home right now. To evoke future-focused temporal construal, participants were asked to imagine what their future residence is likely to be and answer the same series of questions about their future residence. Participants were told to take the time to answer the questions at some length.

After the temporal construal manipulation, participants completed a filler task, examining a series of print ads for a few unrelated products and answering some questions about the advertised products. Participants then completed a questionnaire which measured their time perspectives, attitudes toward various snack foods including M&M's and raisins, eating habits, and thoughts that occurred to them throughout the study session. When participants had finished the tasks, they were instructed to put the completed questionnaires back in their envelopes and leave all of the study materials including the questionnaires, envelopes, and plates with the left-over food on their desks and exit the room. After all participants had left the room, the administrator counted the numbers of M&M's and raisins remaining on each plate, weighed them on a small kitchen scale, and recorded the information.

### Measures

Participants' mood was measured using the average of the six nine-point semantic differential scale items used in the previous studies ( $\alpha = .90$ ), which were coded so that higher ratings indicated more positive moods. Temporal construal was measured using the average of a subset of eight five-point Likert scale items from the Zimbardo Time Perspective Inventory (ZPTI) (Zimbardo & Boyd, 1999), which are relevant to measurement of situational present- or future-oriented temporal construal. Shorter versions of the ZPTI scale and subscales have been tested and used in many different forms (Crockett, Weinman, Hankins, & Marteau, 2009; D'Alessio, Guarino, De Pascalis, & Zimbardo, 2003; Fiulaine & Martinez, 2011; Wakefield, Homewood, Taylor, Mahmut, & Meiser, 2010; Zimbardo, Keough, & Boyd, 1997). These studies used different subsets of the items which fit the specific contexts of the studies or were based on factor loadings.

In our study, eight items were selected for their face validity in measuring one's situation-specific time perspective, in contrast to the other scale items which involve one's chronic, dispositional time perspective. The eight items were: "I do things impulsively;" "I make decisions on the spur of the moment;" "I feel that it's more important to enjoy what you're doing than to get work done on time;" "It takes joy out of the process and flow of my activities, if I have to think about goals, outcomes, and products;" "Spending what I earn on pleasures today is better than saving for tomorrow's security;" "I try to live my life as fully as possible, one day at a time;" "It is more important for me to enjoy life's journey than to focus only on the destination;" and "Meeting tomorrow's deadlines and doing other necessary work comes before tonight's play." The items were coded so that higher ratings indicated stronger present-focused construal. These items covered the three ZPTI dimensions pertinent to present- vs. future-oriented construal (i.e., present-hedonistic, present-fatalistic, and future) and exhibited a fair degree of internal consistency ( $\alpha = .71$ ).

The amounts of each food consumed were measured by subtracting the weight of the food remaining on each of the participant's plates from that of the full-plate weights of M&M's (45 g) and raisins (42 g) served. In addition, four nine-point scales (1 = not at all, 9 = very much) measured participants' perceptions of M&M's and raisins as to how much they liked them as snacks, how tasty they were, how healthy they were, and how enjoyable they were.

## Results

### Manipulation checks

Twenty two participants were excluded from the analysis; three did not complete the tasks in the specified order, three accidentally spilled the foods, four saw foods from previous sessions being weighed, eight guessed the hypotheses, and four were in a disruptive session. A 2 (mood)  $\times$  2 (temporal construal) ANOVA indicated that the mood manipulation worked - participants in the positive mood condition ( $M = 6.7$ ) reported being in a more positive mood than those in the negative mood condition ( $M = 4.3$ ;  $F(1, 125) = 93.73, p < .001$ ). The effects of temporal construal ( $F(1, 125) = .86, p = .356$ ) and the interaction term ( $F(1, 125) = 2.73, p < .101$ ) were not significant, indicating that the mood manipulation was consistent across temporal construal conditions. The analysis also indicated that the temporal construal manipulation worked - participants in the proximal construal condition ( $M = 3.1$ ) reported stronger present-focused construal than those in the distal construal condition ( $M = 2.8$ ;  $F(1, 125) = 8.33, p < .01$ ). The effects of mood ( $F(1, 125) < .01, p = .968$ ) and the interaction term ( $F(1, 125) = 2.02, p < .157$ ) were not significant, indicating that the temporal construal manipulation was consistent across mood conditions.

In addition, a series of repeated measures ANOVA's with food (M&M's vs. raisins) as the within-subject factor and mood and temporal construal as the between-subject factors indicated that participants perceived M&M's tastier ( $M = 7.5$ ) than raisins ( $M = 4.9$ ;  $F(1, 125) = 108.78, p < .001$ ), perceived M&M's more enjoyable ( $M = 7.4$ ) than raisins ( $M = 4.9$ ;  $F(1,$

125) = 95.07,  $p < .001$ ), perceived M&M's less nutritious ( $M = 1.8$ ) than raisins ( $M = 7.2$ ;  $F(1, 125) = 949.79$ ,  $p < .001$ ), and liked M&M's more ( $M = 6.9$ ) than raisins ( $M = 5.1$ ;  $F(1, 125) = 47.32$ ,  $p < .001$ ) as a snack. None of the between-subject factors had significant main effects and the only significant interaction effect was the food-temporal construal interaction effect on how enjoyable the two snacks are ( $F(1, 125) = 4.08$ ,  $p = .045$ ). Further examination of the interaction effect revealed that participants in both the future-focused construal condition ( $M_{M\&M's} = 7.2$  vs.  $M_{raisins} = 5.3$ ;  $t(53) = 5.41$ ,  $p < .001$ ) and those in the present-focused construal condition ( $M_{M\&M's} = 7.5$  vs.  $M_{raisins} = 4.5$ ;  $t(57) = 7.24$ ,  $p < .001$ ) perceived M&M's more enjoyable than raisins, although the difference was greater in the present-focused condition. Moreover, there was no significant difference between the two temporal construal conditions in terms of how enjoyable M&M's ( $M_{present-focused} = 7.1$  vs.  $M_{future-focused} = 6.7$ ;  $t(127) = 1.16$ ,  $p = .249$ ) and raisins ( $M_{present-focused} = 4.9$  vs.  $M_{future-focused} = 5.3$ ;  $t(127) = 1.02$ ,  $p = .311$ ) were. Thus, raisins well represented healthy foods and M&M's well represented indulgent foods across all conditions.

### Food consumption

To test the effects of mood and temporal construal on consumption of healthy vs. indulgent food, we examined the effects of the two variables on the ratio of M&M's consumed to total food consumed (see Fig. 3). For this analysis, 17 participants who ate nothing were excluded.

A 2 (mood)  $\times$  2 (temporal construal) ANCOVA on the ratio of M&M's consumed to total food consumed, with liking for M&M's and raisins as covariates, revealed a significant main effect of mood ( $F(1, 106) = 10.52$ ,  $p = .002$ ), such that the ratio of M&M's consumed to total food consumed was greater for participants in the negative mood condition ( $M = 74.4\%$ ) than for those in the positive mood condition ( $M = 53.5\%$ ). The analysis also revealed a significant main effect of temporal construal ( $F(1, 106) = 7.08$ ,  $p = .009$ ), such that the ratio of M&M's consumed to total food consumed was greater for those in the present-focused temporal construal condition ( $M = 73.0\%$ ) than for those in the future-focused temporal construal condition ( $M = 55.3\%$ ). In addition, the analysis revealed a significant effect of liking for raisins ( $F(1, 106) = 19.56$ ,  $p < .001$ ), such that the more participants liked raisins the lower the ratio of M&M's consumed to total food consumed. Finally, the mood-temporal construal interaction effect was not significant ( $F(1, 106) = .48$ ,  $p = .488$ ).

Pairwise comparisons were used to gain insight into the mediating role of temporal construal in the relationship between mood and food consumption. Findings indicate that the ratio of M&M's consumed to total food consumed by participants in the positive mood condition was significantly greater ( $t(51) = 2.52$ ;  $p = .015$ ) when they were primed with present-focused temporal construal ( $M = 64.65\%$ ) than when they were primed with future-focused construal ( $M = 41.94\%$ ). Since the ratio of raisins consumed to total food consumed is 1 — (the ratio of M&M's consumed to total food consumed), another way to view this finding is as indicating that the ratio of raisins consumed to total food consumed by participants in the positive mood condition

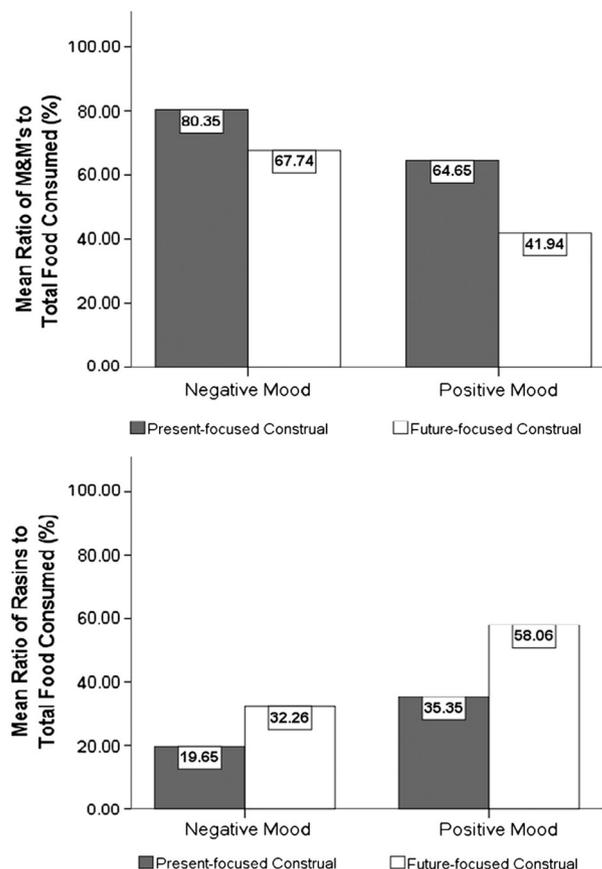


Fig. 3. Effect of temporal construal as a moderator of mood effect on food consumption (Study 3).

was significantly greater ( $t(51) = 2.52$ ;  $p = .015$ ) when they were primed with future-focused temporal construal ( $M = 58.1\%$ ) than when they were primed with present-focused construal ( $M = 35.4\%$ ). The ratio of M&M's consumed to total food consumed by participants in the negative mood condition was less when they were primed with future-focused temporal construal ( $M = 67.7\%$ ) than when they were primed with present-focused construal ( $M = 80.4\%$ ), but this difference was not statistically significant ( $t(57) = 1.65$ ;  $p = .105$ ).

### Thought listing

In order to gain insight into whether the effects of mood and temporal construal on food consumption are mediated by differences in the construal of food benefits, two coders who were unaware of the hypotheses classified the collected thoughts into four categories, depending on whether they were food-related or not and whether they were at a distal, abstract construal level or at a proximal, concrete construal level (Lieberman et al., 2002). Then, Hayes and Preacher's (2013) MEDIATE procedure was conducted using the number of food-related distal, abstract thoughts and the number of food-related proximal, concrete thoughts as mediators, with liking for raisins and liking for M&M's as covariates. Findings failed to produce solid evidence of the mediation. They indicated that, as a group, the independent variables - mood (0 = negative mood, 1 = positive mood), temporal construal

(0 = present-focused, 1 = future-focused), and their interaction term - had a significant direct effect ( $F(3, 104) = 5.97, p < .001$ ) on the ratio of M&M's to total food consumed. However, none of the independent variables had a significant effect on the mediating variables—the numbers of health-related food thoughts and pleasure-related food thoughts—and thus, none of them had significant indirect effects on the ratio of M&M's to total food consumed through either type of thoughts.

## Discussion

The findings of Study 3 provide evidence that the effect of mood on consumption of indulgent vs. healthy food is moderated by temporal construal. Specifically, Study 3 showed that a positive mood led to greater proportional consumption of healthy foods, and that this effect was reduced when present-focused temporal construal was primed. Likewise, Study 3 showed directionally that a negative mood led to greater proportional consumption of indulgent foods, and that this effect was reduced when future-focused temporal construal was primed, but this effect failed to reach statistical significance. These findings provide some support for the hypotheses that a negative mood leads to preference for indulgent foods because it prompts proximal temporal construal which puts heavier weight on short-term benefits of foods such as immediate affect regulation and that a positive mood is consistent with a preference for healthy foods because it prompts distal temporal construal which puts greater weight on long-term benefits of foods such as health and well-being. Therefore, Study 3 provides support for the role of temporal construal in explaining the effects of mood on food consumption.

However, Study 3 failed to find supporting evidence for the mediating role of food benefit construal. One possible reason for this failure is the ineffectiveness of the open-ended question used to examine the thinking process. On average, participants recorded 2.20 thoughts in response to the question with only .33 health-related food thoughts and .40 pleasure-related food thoughts. With such a small number of thoughts collected, the open ended measure was unlikely to tease out any meaningful differences across the conditions.

### *Study 4: effects of mood and temporal construal on food choice*

Taken together, studies 1, 2 and 3 provide support for the role of temporal construal in the effects of mood on consumption of healthy vs. indulgent food. However, none of the three studies included the full range of experimental conditions (i.e., the three mood conditions and two temporal construal conditions). Moreover, the role of concrete (taste/enjoyment-oriented) construal versus abstract (nutrition/health-oriented) construal on food choice has not been directly demonstrated in the first three studies.

The purpose of Study 4 is to test the role of temporal construal and taste/enjoyment- versus nutrition/health-oriented benefits of food choice in explaining the effects of mood on food consumption in a comprehensive study which encompasses three mood conditions (i.e., neutral, positive, and negative mood conditions)

and two temporal construal (i.e., future-focused and present-focused) conditions. Therefore, a 3 (mood: negative vs. neutral vs. positive)  $\times$  2 (temporal construal: present-focused vs. future-focused) experiment was conducted and taste/enjoyment- versus nutrition/health-oriented construal was assessed.

## Method

### *Participants and procedure*

A total of 110 students recruited from a university in the northeastern United States participated in the study; seven participants were excluded from analyses because they did not complete the whole task or did not follow the procedure properly. Participants were seated at computers separated by screens so they could not see each other's responses. They were told they were participating in three unrelated studies, which were being run in the same session to make efficient use of time. The mood manipulation followed the same emotion priming method (Garg et al., 2007) used in Study 3 with the addition of a neutral condition. The manipulation was once again disguised as a survey of the things and events that can be potentially used to induce various emotional responses in advertisements for products. Participants were first asked to "write a good paragraph — about 4 sentences" describing four things (objects, persons, animals, places, etc.) that make them feel happy (vs. sad vs. neutral) in as much detail as they can. Then, they were asked to describe one event in their lives that made them feel happiest (vs. saddest vs. most completely neutral) in as much detail (about 6 sentences) as possible so that someone reading the story would experience the same feelings. Then, participants saw instructions to proceed with the "second study" which they were told was unrelated to the first study.

The second study began with a temporal construal manipulation which was almost identical to the one used in Study 3. The only modification was that additional verbiage was used to encourage participants to address each question in greater detail. Upon completion, participants saw instructions to proceed to the "third study."

In the third study, using a measurement procedure modified from that used by Passyn, Luce, and Kahn (2006), participants were presented with pictures of two sets of four snack plates containing different mixes of three healthy foods (orange slices, cucumber slices, and grapes) and three indulgent foods (cupcakes, chocolate kisses, and chocolate peanut butter cups). In the first set, all four plates contained all six different foods. However, the ratio of healthy and indulgent foods on each plate was systematically varied to emulate an interval scale measuring the participants' preference for healthy or indulgent foods. That is, while the ratio of healthy foods to indulgent foods on the healthiest plate was 80% to 20%, it was 60 to 40 on the second plate, 40 to 60 on the third plate, and 20 to 80 on the unhealthiest plate. The four plates were placed in the order of the ratio with the healthiest plate on the left and the unhealthiest one on the right. In the second set, the healthiest plate contained 100% healthy foods (i.e., only orange slices, cucumber slices, and grapes) and the unhealthiest plate contained 100% indulgent foods (i.e., only cupcakes, chocolate

kisses, and chocolate peanut butter cups). One of the two middle plates contained two thirds of healthy foods and one third of indulgent foods and the other plate contained one third of healthy foods and two thirds of indulgent foods. The plates were placed in the order of the ratio with the unhealthiest one on the left and the healthiest one on the right. In all cases the total amount of foods on each plate and the locations of the foods on the plates were kept constant. Participants were asked which plate from each set they would choose if they were hungry

Next, participants were asked to indicate whether their thoughts while they were thinking about which plate to choose were “enjoyment- or health-oriented” and “taste- or nutrition-oriented” on two separate four-point semantic differential scale items. This forced-choice measure of thinking process was used in Study 4 because the open-ended question used in Study 3 was ineffective. Responses to these items were coded so that higher numbers indicate health- and nutrition-oriented benefits of the choice. The mean rating on these two items was used as the measure of the nature of participants’ benefit construal of food choice (Benefits). After that, two separate nine-point semantic differential scale items measured participants’ perceptions of the snack foods presented on the plates as to how tasty and nutritious they were. They also provided information on their eating habits and demographics. We note that the manipulations of mood and temporal construal were very similar to those in Study 3, so we did not add to the length of the experimental session or call participants’ attention to the manipulations by assessing mood and temporal construal in Study 4. Instead, at the end of the study, participants indicated whether they had thought about happy feelings or sad feelings as part of the research session on a single seven-point semantic differential scale item (1 = happy feelings; 7 = sad feelings) and whether they had thought about the future or the present as part of the research session on another single seven-point semantic differential scale item (1 = the future; 7 = the present). These items were reverse coded.

## Results

### Manipulation checks

An ANOVA on the mood manipulation check (see Table 3), with mood and temporal construal as factors, indicated a significant main effect of mood such that participants reported that they remembered thinking about feelings as instructed ( $M_{negative} = 2.22$  vs.  $M_{neutral} = 4.34$  vs.  $M_{positive} = 6.33$ ;  $F(2, 97) = 141.61$ ,  $p < .001$ ). Temporal construal had no significant main effect ( $F(1, 97) = 2.54$ ,  $p = .114$ ) but there was a significant interaction between temporal construal and mood ( $F(2, 97) = 5.19$ ,  $p = .007$ ). Further examination of the interaction indicated that participants in the present-focused temporal construal condition had greater differences in the mood measure ( $M_{negative} = 1.85$  vs.  $M_{neutral} = 4.80$  vs.  $M_{positive} = 6.65$ ;  $F(2, 50) = 115.26$ ,  $p < .001$ ) than those in the future-focused condition ( $M_{negative} = 2.47$  vs.  $M_{neutral} = 3.82$  vs.  $M_{positive} = 6.00$ ;  $F(2, 47) = 44.91$ ,  $p < .001$ ). However, post-hoc analysis based on LSD indicated that all pairwise differences in the mood measures were significant in both the present-focused temporal construal condition ( $M_{negative} = 1.85$  vs.

$M_{neutral} = 4.80$ ,  $p < .001$ ;  $M_{neutral} = 4.80$  vs.  $M_{positive} = 6.65$ ,  $p < .001$ ;  $M_{negative} = 1.85$  vs.  $M_{positive} = 6.65$ ,  $p < .001$ ) and the future-focused temporal construal condition ( $M_{negative} = 2.47$  vs.  $M_{neutral} = 3.82$ ,  $p = .004$ ;  $M_{neutral} = 3.82$  vs.  $M_{positive} = 6.00$ ,  $p < .001$ ;  $M_{negative} = 2.47$  vs.  $M_{positive} = 6.00$ ,  $p < .001$ ). The results indicate that the mood manipulation was successful across temporal construal conditions, although stronger in the present-focused condition than in the future-focused condition.

An ANOVA on the temporal construal manipulation check, with mood and temporal construal as factors, indicated that participants reported thinking about respectively future- or present-oriented thoughts ( $M_{future} = 5.60$  vs.  $M_{present} = 2.93$ ;  $F(1, 97) = 62.33$ ,  $p < .001$ ) while they participated in the research session. Neither the main effect of mood ( $F(2, 97) = .20$ ,  $p = .821$ ) nor the interaction of mood with temporal construal ( $F(2, 97) = .85$ ,  $p = .429$ ) were significant. The results indicate that the temporal construal manipulation was robust across mood conditions.

Repeated measures ANOVA, with the two types of food as the within-subject factor and mood and temporal construal as between-subject factors, indicated that participants perceived the three healthy foods to be more nutritious than the three indulgent foods ( $M_{healthy} = 8.66$  vs.  $M_{indulgent} = 1.48$ ;  $F(1, 97) = 3006.31$ ,  $p < .001$ ). The between-subject factors had no significant main or interaction effects, and had no interaction effects with the within-subject factor. A separate repeated measures ANOVA, with two types of food as the within-subject factor and mood and temporal construal as between-subject factors, indicated that participants perceived the three healthy foods to be less tasty than the indulgent foods ( $M_{healthy} = 6.84$  vs.  $M_{indulgent} = 7.41$ ;  $F(1, 97) = 5.27$ ,  $p = .024$ ). Once again, the between-subject factors had no significant main or interaction effects, and had no significant interaction effects with the within-subject factor. These results indicate that the six food items represented healthy foods and indulgent foods properly.

### Food choice

Repeated measures ANOVA on the percentage of healthy food on the chosen plates, with the two sets of plates as the within-subject factor and mood and temporal construal as the between-subject factors, revealed a significant main effect of the within-subject factor ( $M_{set1} = 67.2\%$  vs.  $M_{set2} = 61.2\%$ ;  $F(1, 97) = 6.42$ ,  $p = .013$ ), such that the participants chose healthier plates when all plates in the set contained a mix of healthy and indulgent foods than when a plate with only healthy snacks and a plate with only indulgent snacks were included in the set. However, none of the possible interaction effects involving the within-subject factor and the between-subject factors were significant, indicating that all effects of the between-subject factors were consistent across the two sets. Thus, participants’ responses to the two sets were aggregated (i.e., averaged) to test the effects of the between-subject factors.

Tests of the between-subject effects on the average percentage of healthy foods on the chosen plates, shown in Table 3, revealed that the main effect of temporal construal was significant ( $M_{future} = 70.2\%$  vs.  $M_{present} = 58.5\%$ ;  $F(1, 97) =$

Table 3  
Treatment means and standard deviations (in parentheses) from Study 4.

Dependent variable	Temporal construal	Mood				ANOVA		
		Negative	Neutral	Positive	Total	Effect	F	Sig.
Food benefit construal	Present	2.27 (1.05)	2.33 (.80)	2.23 (.66)	2.27 (.81)	Mood	.60	.550
	Future	2.63 (.81)	3.00 (.77)	3.00 (.69)	2.86 (.76)	Temporal construal	14.19	.000
	Total	2.48 (.92)	2.56 (.84)	2.61 (.77)	2.56 (.84)	Mood × TC	.62	.540
Average % of healthy foods on the chosen plates	Present	54.9 (20.3)	58.8 (22.2)	60.5 (21.1)	58.5 (21.1)	Mood	1.01	.369
	Future	67.0 (16.7)	68.5 (17.3)	74.2 (15.0)	70.2 (16.2)	Temporal construal	9.40	.003
	Total	62.1 (18.9)	62.3 (20.8)	67.3 (19.4)	64.2 (19.6)	Mood × TC	.09	.911
Mood	Present	1.8 (1.0)	4.8 (0.9)	6.7 (0.8)	4.8 (2.1)	Mood	141.61	.000
	Future	2.5 (1.3)	3.8 (1.5)	6.0 (0.9)	4.2 (2.0)	Temporal construal	2.54	.114
	Total	2.2 (1.2)	4.5 (1.2)	6.3 (0.9)	4.5 (2.0)	Mood × TC	5.19	.007
Temporal construal	Present	2.5 (1.5)	3.3 (2.1)	3.0 (2.1)	3.0 (2.1)	Mood	.20	.821
	Future	5.8 (1.3)	5.5 (1.2)	5.5 (1.3)	5.6 (1.3)	Temporal construal	62.33	.000
	Total	4.4 (2.2)	4.1 (2.1)	4.2 (2.1)	4.2 (2.1)	Mood × TC	.85	.429

9.40,  $p = .003$ ), indicating that participants in the future temporal construal condition chose plates with greater percentages of healthy foods than those in the present temporal construal condition. However, the main effect of mood ( $F(2, 97) = 1.01$ ,  $p = .369$ ), and the interaction of mood and temporal construal ( $F(1, 97) = .09$ ,  $p = .911$ ) were not significant.

### Benefit construal

An ANOVA on construal of food benefits (i.e., the mean rating on the items assessing food benefit-orientation while choosing the plates), shown in Table 3, revealed that temporal construal had a significant main effect ( $M_{future} = 2.86$  vs.  $M_{present} = 2.27$ ;  $F(1, 97) = 14.19$ ,  $p < .001$ ), indicating that participants in the future temporal construal condition gave greater consideration to health- and nutrition-oriented benefits, as opposed to taste- and enjoyment-oriented benefits, than those in the present temporal construal condition when choosing the plates. However, the main effect for mood ( $F(2, 97) = .60$ ,  $p = .550$ ) and the interaction of mood with temporal construal ( $F(2, 97) = .62$ ,  $p = .540$ ) were not significant.

Next, following recent work in the analysis of mediation (Iacobucci, 2012; MacKinnon & Cox, 2012; Zhao, Lynch, & Chen, 2010), Hayes and Preacher's (2013) bootstrap test of indirect effects was conducted to test whether the health/nutrition-oriented versus taste/enjoyment-oriented benefit construal of foods mediated the effects of mood and temporal construal on the percentage of healthy foods on the chosen plates (Avg\_H\_Percentage). The regression model had five dichotomous independent variables - a dummy for positive mood

(PosMood), a dummy for negative mood (NegMood), a dummy for future-oriented temporal construal (TC), two interaction terms for mood and temporal construal (PMTC and NMTC), and one interval scale mediator variable (Benefits).

As shown in Table 4, the bootstrap results of indirect effects indicated that future-oriented temporal construal had a significant and positive indirect effect on the percentage of healthy foods on the chosen plates through benefits ( $b = 9.79$ , S.E. = 4.35;  $LLCI_{95\%} = 1.57$ ,  $ULCI_{95\%} = 18.37$ ), but none of the mood dummy variables and interaction terms did. In addition, the omnibus test of direct effect of the independent variables indicated that the addition of the independent variables to a model of food choice with benefits as the sole predictor did not improve the fit of the model ( $F(5, 96) = .673$ ,  $p = .645$ ), indicating no direct effect of mood or temporal construal. Finally, the test of homogeneity of regression indicated that the effect of benefits on food choice was not dependent upon the level of any independent variable ( $F(5, 91) = .522$ ,  $p = .759$ ), enabling the interpretation of direct and indirect effects of independent variables on food choices (Hayes & Preacher, 2013). Hence, the results indicate the "indirect only mediation" of the effects of temporal construal on the percentage of healthy foods on the chosen plates, according to Zhao et al.'s (2010) typology of mediations.

### Discussion

The findings of Study 4 differ from those of Study 3 in two ways. First, our mediation analysis found supporting evidence for the role of food benefit construal in mediating the effect of

Table 4  
Hayes–Preacher “MEDIATE” procedure results for Study 4.

Variables in the full model																	
Y =	Avg_H_Percentage (average percentage of healthy foods on the chosen plates)																
M =	Benefit (food benefit construal)																
X =	PosMood (dummy for positive mood)																
	NegMood (dummy for negative mood)																
	TC (dummy for future-focused temporal construal)																
	PMTC																
	NMTC																
Outcome variable: Avg_H_Percentage						Outcome variable: benefit						Outcome variable: Avg_H_Percentage					
Model summary (total effects model)						Model summary						Model summary					
R <sup>2</sup>	Adj.R <sup>2</sup>	F	df1	df2	p	R <sup>2</sup>	Adj.R <sup>2</sup>	F	df1	df2	p	R <sup>2</sup>	Adj.R <sup>2</sup>	F	df1	df2	p
.110	.064	2.392	5	97	.043	.148	.104	3.376	5	97	.007	.434	.398	12.25	6	96	.000
Model coefficients (total effects model)						Model coefficients						Model coefficients					
	Coeff.	S.E.	t	p		Coeff.	S.E.	t	p		Coeff.	S.E.	t	p			
Constant	58.84	4.251	13.84	.000	Constant	2.325	.177	13.155	.000	Constant	25.109	5.686	4.416	.000			
PosMood	1.665	6.012	.277	.782	PosMood	-.100	.250	-.400	.690	<b>Benefit</b>	<b>14.508</b>	<b>1.958</b>	<b>7.411</b>	<b>.000</b>			
NegMood	-3.971	6.773	-.586	.559	NegMood	-.056	.282	-.198	.843	PosMood	3.116	4.824	.646	.520			
TC	9.646	7.136	1.352	.180	<b>TC</b>	<b>.675</b>	<b>.296</b>	<b>2.275</b>	<b>.025</b>	NegMood	-3.162	5.431	-.582	.562			
PMTC	4.021	9.331	.431	.668	PMTC	.100	.388	.258	.797	TC	-.147	5.872	-.025	.980			
NMTC	2.508	9.887	.254	.800	NMTC	-.313	.411	-.761	.449	PMTC	2.570	7.483	.344	.732			
Omnibus test of total effect						Indirect effect(s) through: benefit						Test of homogeneity of regression (X * M interaction)					
R <sup>2</sup>	F	df1	df2	p		Effect	SE(boot)	LLCI	ULCI		R <sup>2</sup>	F	df1	df2	p		
.110	2.392	5	97	.043	PosMood	-1.451	3.377	-.465	4.933	Benefit	.016	.522	5	91	.759		
					NegMood	-.809	5.091	-11.75	9.127								
					<b>TC</b>	<b>9.793</b>	<b>4.350</b>	<b>1.568</b>	<b>18n370</b>								
					PMTC	1.451	5.178	-7.751	12.850								
					NMTC	-4.536	6.727	-18.09	8.945								
					OMNIBUS	1.514	.974	-.094	2.818								
Omnibus test of direct effect																	
R <sup>2</sup>	F	df1	df2	p													
.020	.673	5	96	.645													

Note. Number of samples used for indirect effect is 1000. Level of confidence for confidence intervals is 95. Bias corrected bootstrap confidence intervals for indirect effects.

Please cite this article as: Gardner, M.P., et al., Better moods for better eating?: How mood influences food choice, *Journal of Consumer Psychology* (2014), <http://dx.doi.org/10.1016/j.jcps.2014.01.002>

temporal construal on food choice in Study 4, but not in Study 3. Second, a mood effect was found in Study 3, but not in Study 4. One possible reason why no mood effect was found in Study 4 is that the effect of temporal construal in Study 4 was so strong that it overrode the effect of mood on food benefit construal and choice, possibly because we had encouraged participants to address each question in the temporal construal manipulation task in greater detail than in Study 3. If this was the case, then, the finding of no mood effect provides additional support for the proposition that the effects of mood on food choices are mediated by temporal construal.

### General discussion

By integrating the affect regulation hypothesis (Andrade, 2005; Wegener & Petty, 1994) and temporal construal theory (Labroo & Patrick, 2009) in the context of food preferences, the current research has explored whether positive and negative moods lead to differential preferences for indulgent foods and healthy foods. The findings are consistent with our hypothesis that individuals in a negative mood prefer indulgent foods to healthy foods because a negative mood invokes proximal, concrete construal which puts more weight on immediate concerns such as mood repair and the affective benefits of foods such as taste and sensory experiences. In contrast, individuals in a positive mood prefer healthy foods to indulgent foods because a positive mood invokes distal, abstract construal which puts more weight on long-term, higher-level benefits of foods such as health and well-being.

The current research makes three contributions to the discussion of how mood influences food preferences. First, it demonstrates that individuals can seek out both indulgent foods and healthy foods depending upon their mood states. For example, individuals in a positive mood are likely to prefer foods that are high in nutrients and low in sugar, salt, and fat for long-run health and well-being, while those in a negative mood are likely to prefer indulgent foods that contain more sugar, salt, and fat for an immediate boost to their energy and mood. The findings can make up for the under-represented area in past clinical research about the role of healthy foods.

Second, the current research offers empirical evidence for temporal construal as an underlying mechanism by which individuals in different moods come to prefer indulgent foods versus healthy foods. Our findings indicate that individuals in a positive mood prefer eating healthy foods that are rated more favorably in higher-level construals such as health and nutrition and that they think more about these things. In contrast, individuals in a negative mood prefer eating indulgent foods that are evaluated more favorably in lower-level construals such as mood management which is, in turn, associated with taste and sensory experience, consistent with their present-focused orientation. These findings can serve as a springboard for future investigations of the role of temporal construal in food choice and other behaviors related to health and well-being.

Third, individuals in negative moods make food choices influenced by temporal construal which encourages proximal perspective consistent with mood repair motivation. In light of

this deliberate role that eating plays, merely suggesting that individuals not eat the foods that have comforted them in the past when experiencing negative moods is expected to have limited effectiveness. Because our findings suggest that individuals in negative mood states eat indulgent foods as immediate, hedonic rewards, it might be more effective to call their attention to more innocuous domains for repairing their mood such as watching movies, listening to music, or talking to friends, rather than relying solely on labels which contain either warnings or nutritional information.

The current research also has limitations that offer avenues for future investigations. Although the findings generalize robustly across different product categories in the laboratory, their external validity would be enhanced if they were validated with field studies involving real-world consumption, such as in a movie theater, where mood can be altered by the movie shown (Garg et al., 2007) or in restaurants where service providers can influence consumer mood states (Gardner, 1985). Also, the current research investigated the effects of mood on attitudes, choice and consumption of foods which rated higher on the hedonic items—e.g., taste and sensory experience—and lower on the utilitarian items—e.g., nutrition and healthiness—or vice versa, but some foods can be rated reasonably high on both utilitarian and hedonic items such as frozen yogurt. Future research is needed which uses identical foods that are framed differently (e.g., Labroo & Patrick, 2009).

The current research has used the common-sense notion of indulgent food choices as those that are made for concrete benefits by most people, and is consistent with the fact that concrete construal is more closely linked to bodily experience (Maglio & Trope, 2012) and with Trope and Liberman's (2000) finding that eating cake was evaluated positively by participants primed with a low level of construal and negatively by those primed with a high level of construal. We note, however, that level of construal is related to one's overall goals, and since individuals have different fundamental goals, what is abstract to one person may be concrete to another (Trope & Liberman, 2010). If an individual has an overall goal of hedonism or breaking the Guinness world record as the heaviest person on earth, then that individual would need to discipline him/herself to eat foods which the rest of us would consider indulgences. Research is needed to investigate the effects of mood on food choices for people with such atypical goal structures.

Finally, the current research looked at the influence of mood on food choice at a single moment in time, but future research is needed to understand how such choices affect subsequent mood states, which in turn affect subsequent food choices. Such research might provide insight into what happens when restrained eaters fall off the wagon or when people try to eat just one potato chip.

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