Research Report

Hungry for Money

The Desire for Caloric Resources Increases the Desire for Financial Resources and Vice Versa

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ABSTRACT—*This report attempts to provide an evolutionary explanation for humans' motivation to strive for money in present-day societies. We propose that people's desire for money is a modern derivate of their desire for food. In three studies, we show the reciprocal association between the incentive value of food and of money. In Study 1, hungry participants were less likely than satiated participants to donate to charity. In Study 2, participants in a room with an olfactory food cue, known to increase the desire to eat, offered less money in a give-some game compared with participants in a room free of scent. In Study 3, participants' desire for money affected the amount of M&M's® they ate in a subsequent taste test, but only among participants who were not restricting their food intake in order to manage their weight.*

One of the strongest motivations for people living in modern societies is the desire to obtain money. The cultural dominance of money is striking: It has been adopted irresistibly by any human society that has encountered it (Lea & Webley, 2006). But despite the extraordinary power of money, for most of humankind's history, "resources" have connoted food rather than money (Diamond, 1997). Collecting or producing enough food to survive has always been humans' main challenge. It seems reasonable, then, to consider a biological basis for humans' attraction to money.

The canonical economic model assumes that the utility from money is indirect, and that money is valued only for the goods or services it can procure (e.g., Camerer, Loewenstein, & Prelec, 2005). In psychological terminology, standard economics considers money a conditioned reinforcer. Whereas food is generally considered a primary reinforcer, money can be consumed only indirectly. As a consequence, standard economics views the desire for food and the desire to obtain money as two different strivings. The relation between the two reinforcers must be asymmetric: Money can buy food, but food cannot buy money. However, some neurological evidence suggests that the desires for money and food might be more entwined than most economists would predict. Breiter, Aharon, Kahneman, Dale, and Shizgal (2001) found that the orbitofrontal cortex is activated by monetary rewards, whereas O'Doherty, Deichmann, Critchley, and Dolan (2002) found the orbitofrontal cortex to be activated by the consumption and anticipation of sweet-tasting food rewards. The overlap in neural activation suggests a common pathway for processing money and food rewards, and such a common pathway would have major implications for the standard economic perspective on the utility of money.

Some behavioral evidence is consistent with the proposal that financial and caloric resources are closely entwined. Nelson and Morrison (2005) found that men who feel either poor or hungry prefer heavier women than men who feel rich or satiated. The authors suggested that preference for women's body weight is determined by the individual's experience of resource scarcity. This idea is consistent with the finding that in cultures with scarce resources, heavier women are preferred to slim women (e.g., Pettijohn & Jungeberg, 2004; Symons, 1979). As both financial deprivation and caloric deprivation among men appear to be related to their ideal female body weight, we suggest that cues signaling scarcity in one domain might motivate people to acquire or maintain resources in the other domain. Thus, we claim that people are less likely to sacrifice money when they desire food than when they are satiated, and that people eat more when they desire money than when their desire for money is low. Three studies tested this hypothesis.

STUDY 1

The goal of Study 1 was to show that hunger affects donation behavior. We manipulated hunger and measured participants'

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willingness to donate to charity. If deprivation of food increases desire for money, then hungry participants should donate less than satiated participants.

Method

Eighty-eight undergraduates (80 men) participated in exchange for course credit. They had been asked not to eat during the 4 hr prior to the study and not to drink anything but tea, coffee, or water. Eighteen participants failed to comply and were excluded. The remaining participants received a donation scenario and a taste test. In the hunger condition, the donation scenario preceded the taste test ($n = 33$). In the satiated condition, the order was reversed ($n = 37$).

We told participants that we were investigating their donation behavior. The general instruction read as follows:

> To be able to adjust the annual donation drive of the Marketing Department, we want some feedback concerning your donation preferences. You will be presented with ten different hypothetical situations. Please try to indicate for each situation whether you would donate or not.

All scenarios explained that the marketing department each year organized a donation drive and that all marketing students and experimental participants were given the chance to make a donation as well; after experimental sessions, participants were supposedly approached to make a donation. The 10 situations differed only in the charity referred to (e.g., the Red Cross, Doctors Without Borders).

During the taste test, participants had to eat a big piece of cake and answer 20 questions about the taste, color, texture, and healthiness of the cake. In the satiated condition, participants completed filler tasks before the donation task so that satiation, which takes about 20 min (Guyton, 1971), would set in.

Results

Four participants who had not completed the questionnaire properly were removed from the analysis. The remaining participants' 10 binary choices were submitted to a repeated logistic regression with experimental condition as the predictor. The results revealed that hungry participants were less likely to donate (mean donation probability = .36) than satiated participants were (mean donation probability = .44), likelihood ratio (LR) $\chi^2(1, N = 66) = 4.64$, $p_{rep} = .906$, log(odds ratio) = .35. That is, hunger makes people hold on to their money more than they do when satiated.

STUDY 2

In Study 1, satiated participants may have felt obligated to reciprocate for the cake. In Study 2, we ruled out reciprocity as an alternative explanation by using an olfactory food cue to manipulate the desire to eat food. Participants had to play a give-some game in a room that either was or was not scented with freshly baked brownies. Exposure to an olfactory food cue is known to increase craving for, liking of, and the desire to eat the cued food (e.g., Federoff, Polivy, & Herman, 2003).

Method

Fifty-eight undergraduates (all women) participated for course credit. All participants had eaten during the 4 hr before the experiment. Time since the last meal was recorded to control for nonexperimental variation in hunger. In the scent condition ($n = 32$), the scent of baking brownies wafted into the laboratory when participants entered. In the control condition ($n = 26$), no scent was present in the lab. The scent manipulation was counterbalanced with time of day.

Next, participants played a computerized give-some game. They were allocated 10 euro coins, which they could either keep or donate to their opponent, who would simultaneously make the same decision. Each coin kept was added to the participant's account; each coin donated was doubled by the experimenter and added to the opponent's account. To make the procedure consequential, the experimenter announced that 5 randomly selected participants would actually be paid according to the outcome of the game.

Results

An analysis of variance with number of coins donated as the dependent variable, scent presence as the independent variable, and time since the last meal as a control variable revealed that participants in the scent condition gave fewer coins to their opponent compared with participants in the control condition (scent: $M = 2.7$, control: $M = 3.9$), $F(1, 55) = 4.18$, $p_{rep} = .883$, $\eta_p^2 = .071$. There was no effect of time since the last meal, $F(1, 55) = 2.80$, n.s.

STUDY 3

Studies 1 and 2 suggest that the desire for food makes people more likely to hold on to their money. In Study 3, we tested the inverse relation. We manipulated participants' desire for money by inducing fantasies about winning a lottery. If hunger and desire for money influence one another, desire for money should affect the amount of food eaten in a subsequent taste test. We expected that this effect would be attenuated, however, in participants who were restricting their food intake in order to control their weight. Additionally, we controlled for mood because bad mood enhances food consumption (e.g., Macht & Simons, 2000).

Method

Sixty-two undergraduates (20 men) received €7 in return for their participation. Half the respondents were asked to imagine

winning €25,000 in the lottery (high-desire-for-money condition), whereas the other half imagined winning €25 (low-desire-for-money condition). All participants were instructed to make a list of all the things they would dream of buying if they won the specified amount.

We had pretested this lottery manipulation, relying on Bruner and Goodman's (1947) finding that the value attributed to money can interfere with normal perceptual processing. Given that people with a high desire for money (e.g., poor children) overestimate the size of coins relative to people with a lower desire for money (e.g., rich children), we hypothesized that the estimated size of euro coins would be larger among participants in the €25,000 condition than among participants in the €25 condition. After listing what they would buy if they won the lottery, 38 pretest participants were asked to identify which of seven coin sizes (ranging from 92.5% to 107.5% of the actual size, with the fourth option being the true coin size) was the actual size for each of five coins (€0.10, €0.20, €0.50, €1, and €2). The average estimated coin size (on a scale from 1 to 7) was larger in the high-desire-for-money condition than in the low-desire-for-money condition (high desire: $M = 3.50$; low desire: $M = 2.99$), $t(36) = 2.04$, $p = .049$, $\eta_p^2 = .10$.

In the actual experiment, after the lottery scenario, participants' mood was measured using the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). Subsequently, participants were instructed to complete the taste test. They were given two bowls containing the same volume of food, one containing regular M&M's (400 g), and the other containing the new crispy M&M's (300 g). Participants were told that they were participating in a comparative taste test of M&M's. They were allowed to eat as many M&M's as necessary to evaluate them on several dimensions (e.g., "Are they crunchy?"). Quantity consumed was measured unobtrusively. As in Study 2, time since the last meal was recorded to control for nonexperimental variation in hunger. Participants then received the Dutch Questionnaire of Eating Behavior (van Strien, Frijters, Bergers, & Defares, 1986), which measures the extent to which people restrain their food intake in order to lose, or not gain, weight. Participants were classified as restrained ($n = 26$) if their score on this scale exceeded 2.8 (i.e., the sample median).

Results

An analysis of variance with desire for money and restraint as the independent variables and time since the last meal and gender as control variables revealed a significant main effect of desire for money, $F(1, 56) = 7.07$, $p_{rep} = .95$, $\eta_p^2 = .11$. This main effect was qualified by an interaction with restraint, $F(1, 56) = 3.98$, $p_{rep} = .88$, $\eta_p^2 = .066$. Planned comparisons revealed that the unrestrained participants ate more M&M's in the high-desire-for-money condition than in the low-desire-for-money condition (high desire: $M = 38$ g; low desire: $M = 18$ g), $F(1, 32) = 8.47$, $p_{rep} = .96$, $\eta_p^2 = .21$. The lottery manipulation did not affect the amount consumed by the restrained participants (high desire: $M = 23$ g; low desire: $M = 21$ g), $F(1, 22) < 1$, n.s. In addition, males ate more than females, $F(1, 56) = 5.61$, $p_{rep} = .927$, $\eta_p^2 = .091$, and consumption decreased with increasing time since the last meal, $F(1, 56) = 4.87$, $p_{rep} = .908$, $\eta_p^2 = .080$. Probably participants did not want to spoil their appetites before an upcoming meal.

The effects of desire for money were not mediated by mood. First, the desire-for-money manipulation influenced neither positive mood ($\alpha = .77$; $F < 1$) nor negative mood ($\alpha = .81$; $F < 1$). Second, neither positive mood ($F < 1$) nor negative mood ($F < 1$) affected the amount of M&M's consumed.

GENERAL DISCUSSION

These three studies show a symmetric relation between the incentive value of food and the incentive value of money. In Study 1, hungry participants were less likely to donate to charity than satiated participants. In Study 2, an olfactory food cue, known to increase the desire to eat, made participants offer less money in a give-some game compared with participants in a room without this scent. In Study 3, participants' desire for money affected the amount of M&M's they ate in a subsequent taste test, but only among participants who were not restricting their food intake. We propose that people's desire for money relies on the human adaptation to collect food.

To our knowledge, we are the first to test the psychological link between money and food empirically. According to Gurven (2004), evolutionary psychologists and economists should be careful in generalizing their findings from monetary economic games to nonmarket situations and in drawing conclusions about the evolutionary origins of cooperation on the basis of lab experiments involving money. Part of our contribution, therefore, is providing support to evolutionary psychologists' assumption that findings involving money are informative about findings involving food, and vice versa. Our results may also provide a partial explanation for Nelson and Morrison's (2005) finding that both financial and caloric deprivation among men appear to be related to what is considered the ideal female body weight. The preference of low-income men for heavier women, as well as the acceptability of a larger body size for lower-income women than for higher-income women, for example, might be well predicted from our findings.

An area for future research is the overlap in neurological activation due to desire for money, on the one hand, and desire for food, on the other hand. The emerging evidence that these two reward systems share a brain region (e.g., Breiter et al., 2001; O'Doherty et al., 2002) raises the question of the extent to which this region is involved in the processing of all kinds of rewards (Montague & Berns, 2002; Wilson & Daly, 2004). For example, neural evidence suggests that the same dopaminergic

reward circuitry in the midbrain is activated for a wide variety of reinforcers, including attractive faces (Aharon et al., 2001), funny cartoons (Mobbs, Greicius, Abdel-Azim, Menon, & Reiss, 2003), cultural objects such as sports cars (Erk, Spitzer, Wunderlich, Galley, & Walter, 2002), drugs (Schultz, 2002), and money (Breiter et al., 2001).

The idea that many rewards are processed similarly in the brain has important implications for economics, which assumes that the marginal utility of money depends on what money buys. Our findings suggest that money becomes a primary reinforcer, which means that people value money without carefully computing what they plan to buy with it. The emerging area of neuroeconomics suggests the possibility that the value of money is only loosely linked to consumption utility (Camerer et al., 2005). This possibility is further supported by the noteworthy parallels between findings in the literature on money and the literature on food. The tool theory of money (Lea & Webley, 2006) and set-point theory of food (Pinel, Assanand, & Lehman, 2000) both consider the reinforcer on which they focus, money or food, to be instrumental: Money is viewed as a means to obtain biologically relevant incentives, and food is viewed as a means of preventing the body's energy resources from falling below an energy set point. However, several findings are inconsistent with both instrumental theories. Bruner and Goodman (1947) found that children overestimate the size of coins relative to other stimuli; thus, the value people place on money apparently interferes with their perception of currency. Likewise, people not only eat to restore their energy level, but also eat because of the anticipated pleasure of eating. The more recently advanced drug theory of money (Lea & Webley, 2006) and positive-incentive theory of food (Pinel et al., 2000) can account for these findings, as in these theories, money and food have value beyond their instrumentality.

Finally, the symmetric association between food and money may help explain why poor people are especially vulnerable to overeating and have ill health as a result. In industrialized countries such as the United States (Drewnowski & Specter, 2004), as well as in developing countries (James, 2004), obesity is usually associated with poverty. Perhaps in present-day societies, the attraction to money is so powerful that people who, relatively speaking, fail in their quest for (more) money become frustrated. Accordingly, as financial and caloric resources are exchangeable, they might tend to appease their desire for money by consuming more calories than is healthy.

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