# FOOD CUES, WIDESPREAD RESOURCE AVAILABILITY, AND KIN RELATIONSHIPS INFLUENCE CHARITABLE GIVING

by

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# Food Cues, Widespread Resource Availability, and Kin Relationships Influence Charitable Giving

On June 25, 2006, Warren Buffett pledged an estimated 30 billion dollars in Berkshire Hathaway stock to the Bill and Melinda Gates foundation (Loomis, 2006). This enormous gift from the world's second-richest man initiated a well-publicized campaign that culminated in The Giving Pledge, a public promise from 40 of America's richest families to follow Buffett's example. To date, more than 125 billion dollars have been pledged to charities that will address problems such as the HIV/AIDS epidemic and world hunger (Blackburn, 2010). This display of charity is noteworthy in its grandeur, but equally remarkable, though much less remarked upon, is the fact that charitable giving is a way of life for many Americans. Despite the current economic downturn, charitable giving in the United States amounted to more than an estimated 217 billion dollars in 2009 (Havens & Schervish, 2010). Although this amount is less than what is typically donated during flush economic times, these donations still amounted to more than the entire Gross Domestic Product of all but 37 of the world's nations (World Bank, 2010).

These acts of giving raise an important question: Why do people willingly donate valuable resources to others, even during times of economic scarcity? Donations are influenced by variety of contextual factors, ranging from the level of similarity between the donor and the recipient, to the wording of the solicitation, to the sights, sounds, and smells present at the time of donation (see e.g., Chen-Bo, Bohns, & Gino, 2010; Cialdini, 2001; Holland, Hendriks, & Aarts, 2005; Liljenquist, Chen-Bo, & Galinsky, 2010; Ranganathan & Henley, 2008). Here, I used the function-based theoretical tools made available from evolutionary theory to examine the ways in which charitable giving is influenced by donor-

recipient relatedness, ambient food scents, sex, and resource availability. Specifically, I explored how sex interacted with exposure to food scents to determine charitableness, and I examined how donor-recipient relatedness moderated the degree to which perceptions of resource availability influenced willingness to give.

## Donor-Recipient Relatedness

Throughout human history, relatedness has been an important determinant of helping behavior. An evolutionary understanding of behavior illustrates why: Humans largely evolved in small hunter-gather societies made up exclusively of kin and close allies. Relative to groups with individuals who were unable or unwilling to cooperate, individuals in groups whose members tended to offer aid to their kin and allies (e.g., giving a relative or friend life-sustaining food) had an increased probability of surviving and so did the fellow members of their group. Over the course of evolutionary time, the tendency to be charitable to kin and allies became an adaptive advantage. As a result, charitableness was passed on to future generations (Burnstein, Crandall, & Kitayama, 1994; Dawkins, 1976; Form & Nosow, 1958; Krebs, 1998; Korchmaros & Kenny, 2001; McAndrew, 2002; Wilson & Wilson, 2008).

Research findings in modern humans support this explanation for the evolution of helping behavior (see e.g., DeWall, Baumeister, Gailliot, & Maner, 2008). Researchers have empirically demonstrated that individuals tend to help those who exhibit cues that would have been reliable indicators of group membership for most of evolutionary history, even if complete strangers employ the cues. Helping increases, for instance, when indicators of similarity between the helper and the person in need of aid are highlighted, such as when they share a name (Burger, Messian, Patel, del Prado, & Anderson, 2004), a clothing style (Emswiller, Deaux, & Willits, 1971), a facial characteristic (DeBruine, 2002), or a worldview

(Gray, Russell, & Blockley, 1991). Helping also increases when the person in need of aid engages in a behavior typically associated with familiarity, such as touching the potential helper (Morhenn, Park, Piper, & Zak, 2008). Even the very implication of kinship (e.g., *brother* can you spare a dime) is enough to influence attitudes and behavior (Salmon, 1998).

## The Power of Odor

Kinship, though, is not the only determinant of helping. Social psychology researchers have long known that many contextual features of a situation can help determine the degree to which prosocial behavior will occur. For example, researchers have demonstrated that the presence of bystanders discourages helping (Latané & Darley, 1968). Likewise, helping is reduced when potential helpers are in a rush (Batson, Coke, Jasnoski, & Hanson, 1978; Darley & Batson, 1973). Helping is encouraged, on the other hand, by mood-elevating events, such as finding a dime in a phone booth or receiving an unexpected free cookie (Isen & Levin, 1972; Levin & Isen, 1975; Vrugt & Vet, 2009). Similarly, circumstances that increase mortality salience tend to promote prosocial behavior, especially toward one's ingroup (Jonas, Schimel, Greenberg, & Pyszczynski, 2002). Findings such as these demonstrate that prosocial behavior is influenced by a variety of social factors, many of which are only beginning to come to light.

One of the most intriguing results borne from this line of research is the degree to which odor influences behavior. Olfaction is a vital part of everyday life, and ambient scents influence a wide range of behavior (see e.g., Haviland-Jones & Wilson, 2008 for a review). In the mating domain, for instance, men and women report that olfactory cues help them to determine the attractiveness of members of the opposite sex (Herz & Cahill, 1997). Further, researchers have found that women have the ability to correctly predict men's level of

attractiveness by simply smelling their t-shirts (Thornhill & Gangestad, 1999; Foster, 2008). Women can also use smell to determine which men eat healthful diets (Havlicek & Lenochova, 2006). In a similar fashion, odors also affect coalition formation and status maintenance within and between social groups. Sociologists have long suggested that out-group members are often caricatured in terms of foul odors (e.g., "stinkers" or "skunks;" Largey & Watson, 1972), and psychological research has confirmed this observation by showing that humans seem to be particularly skilled at using odor to differentiate between kin and non-kin individuals (Weisfeld, Czilli, Phillips, Gall, & Lichtman, 2003).

Food scents, in particular, seems to have varied effects on behavior. For example, lemon-scented cleaning products have been found to increase the extent to which individuals clean up after themselves after eating (Holland, et al., 2005). Lemon scents also lead people to report they are healthier (Knasko, 1992). The scent of lavender, an edible flower, tends to increase the amount of time consumers spend relaxing after a meal (Guéguen & Petr, 2006). Somewhat in contrast, other food smells such as cinnamon and mint can increase physiological arousal and attention (Dember, Warm, & Parasuraman, 1996; Raudenbush, Grayhem, Sears, Wilson, 2009), and peppermint can also improve measures of physical athletic performance such as speed and strength (Raudenbush, Corley, & Eppich, 2001).

Taken together, these findings illustrate the diversity of food odors' roles in daily life, but they do not fully describe the extent to which ambient food odors influence prosocial behavior. In that regard, research examining food scents and prosocial behavior is somewhat conflicting. Some researchers, for example, have demonstrated that the scent of food can promote prosocial behavior (Baron, 1997; Baron & Thomley, 1994), but others have shown precisely the opposite (Briers, Pandelaere, Dewitte, & Warlop, 2006). This raises two

important questions: What exactly *are* the effects of food scents on prosocial behavior? And why are they so variable across contexts?

## The Present Research

In the present research, I sought to investigate these issues by exploring whether the scent of food interacted with sex to influence helping behavior (Study 1). I predicted that women would be more charitable than men when specific food scents were present but not when other scents were present. In addition, I explored how perceptions of kinship moderated perceptions of resource availability to determine charitableness (Study 2). I predicted that individuals would be more willing to give to kin than strangers overall, and I predicted that giving to strangers would be further reduced when participants were primed with resource scarcity relative to resource abundance.

### Study 1

#### Food scents and sex.

Further consideration of human history helps to explain why food scents might interact with sex to influence giving. Research examining present-day, hunter-gather societies suggests that men and women would have developed separate resource acquisition and distribution (charity) strategies that were uniquely adaptive for each sex. Historically, men tended to hunt big game, whereas women tended to gather smaller food items. Males' hunting strategy resulted in infrequent opportunities to share large quantities of food, but women's gathering strategy led to frequent opportunities to share smaller amounts of food (see e.g., Hawkes, O'Connella, & Blurton-Jones, 2000).

As a result of these opportunities to share different types of resources, men and women developed sex-differentiated charitable tendencies. Women's most adaptive strategy

was to use their resources to "tend and befriend" by sharing resources freely with others in order to forge relationships with those around them (Taylor, 2006; Taylor, Klein, Lewis, Gruenewald, Gurung, & Updegraff, 2000). In contrast, men's most adaptive strategy was to restrict the sharing of their resources (e.g., meat) to kin and close allies because those individuals were more likely than strangers to participate future sharing of similar resources (Bliege-Bird, Bird, Alden-Smith, & Kushnick, 2002).

In Study 1, I used a food scent (citrus) to actively manipulate men and women's perception that a gatherable food resource (citrus fruits) was present in the environment. I predicted that women would be more charitable than men when the food scent was present. Consistent with Hamilton's rule for altruism (Hamilton, 1964), I also predicted that participants would show an overall greater willingness to give to kin than to strangers.

**Method.**

***Participants.*** Participants were 60 men and 60 women recruited from a population of undergraduate psychology students ($M_{age}$ = 19.35).

***Design and procedure.*** I utilized a 2 (scent: food scent vs. no scent) X 2 (sex: men vs. women) X 2 (relatedness: kin vs. stranger) mixed-model design. Scent and sex were between-subjects variables and relatedness was a within-subjects variable.

The study was conducted in a university computer laboratory. In the food scent condition, a commercially available electronic air freshener was plugged into a wall socket in a corner of the lab 15 minutes before participants arrived. It heated a proprietary blend of oil and fragrance called "lemon citrus," and it diffused the scent in the room throughout the procedure (for the use of similar procedures see e.g., Holland, Hendriks, & Aarts, 2005; Liljenquist et al., 2010). In the control condition, the air freshener was not plugged in. The

remaining procedure was the same in both conditions. All participants arrived in groups of 2-10, and a research assistant directed them to log into a computer. Participants then answered six questions that assessed their general willingness to give to charity. Four of these questions assessed participants' willingness to give money to real charities: Worldvision International, the Humane Society of the United States, the Make-A-Wish Foundation, and Habitat for Humanity. The other two questions assessed participants' general willingness to give: I am willing to give money to charity; I am willing to give money to a stranger.

In order to examine differences between participants' willingness to give to kin and strangers, participants then read eight scenarios about individuals in need and stated their willingness to help the individual in each scenario (for a similar procedure, see Maner & Gailliot, 2007). Four scenarios described a situation in which the recipient of the aid was kin (a sibling), and four described a situation in which the recipient was not kin (a stranger). Willingness to help in each scenario was assessed on Likert-type scales ranging from 1 – 7 (1 = completely unlikely to help, 7 = completely likely to help). Finally, participants stated their sex and age, and they were thanked, debriefed, and dismissed.[1]

**Results.**

***Willingness to give to charity.*** To test the effect of the target scent on individuals' willingness to give money to charitable causes, I first created a composite variable by

[1] Prosocial behavior often increases after mood-elevating occurrences (Isen & Levin, 1972; Levin & Isen, 1975; Vrugt & Vet, 2009), and Baron (1994) found that food scents increased helping in part through changes in mood. To ensure that any differences in charitable attitudes and behaviors were not the result of differences in affect or arousal that could have arisen in response to the scents, participants also completed the Positive and Negative Affect Scale (PANAS: Watson, Clark & Tellegen, 1988). Scores on the PANAS were used to examine whether mood mediated prosocial behavior. The results of a mediation analysis indicated that there was no relationship between affect and overall willingness to give money to charity.

averaging participants' scores on the six items that assessed their willingness to give ($\alpha$ = .87). Next, I entered this composite into a 2 (scent: food vs. no scent) X 2 (sex: men vs. women) between-subjects ANOVA. See Table 1 for descriptive statistics.[2]

**Table 1**

*Smell and Sex Influence Willingness to Give*

| | *Men* | *Women* | |
|---|---|---|---|
| | **M (SD)** | **M (SD)** | **N** |
| Lemon smell | 4.79 (1.33) | 5.70 (.78) | 30 |
| No smell | 5.35 (.94) | 5.32 (1.00) | 30 |

The results of this analysis revealed a main effect of sex on overall willingness to give, $F(1, 116) = 9.98$, $p = .002$, $d = .57$. Namely, women reported more willingness to give to charity than men. The main effect of scent was non significant ($p = .87$), but there was a significant scent X sex interaction on giving, $F(1, 116) = 4.74$, $p = .032$. Probing this interaction showed that women exposed to the food scent showed increased overall willingness to give compared to men in this condition, $F(1, 116) = 14.23$, $p < .001$, $d = .99$. This sex difference was not present in the control condition ($p > .4$).

***Willingness to give to kin versus strangers.*** To test the effects of scent on willingness to give to needy kin versus strangers, I first created two composite variables. The first of

[2] To test whether any changes in prosocial behavior that occurred in response to the scent prime were mediated by the mental accessibility of food concepts, I looked at the effect of the scent manipulation on scores from a lexical decision-making task (food words vs. non words vs. control words). The results of this analysis indicated that the lemon scent did not change the accessibility of participants' cognitive concepts related to food. A mediation analysis indicated that concept accessibility did not mediate the relationship between the food scent and participants' overall willingness to give to charity.

these variables was an average of the eight items that assessed the degree to which participants were willing to give money to kin ($\alpha$ = .72). The second variable was an average of the eight items that assessed the degree to which participants were willing to give money to strangers ($\alpha$ = .74). Next, I entered these composites into a 2 (relatedness: kin vs. stranger) X 2 (scent: food vs. no scent) X 2 (sex: men vs. women) mixed-model ANOVA. Relatedness was a within-subjects variable. Scent and sex were between-subjects variables. See Table 2 for the descriptive statistics from this analysis.

**Table 2**

*Sex and Relatedness Influence Willingness to Give*

| | *Men* | | *Women* | *Total* |
|---|---|---|---|---|
| | **N** | **M (SD)** | **M (SD)** | **M (SD)** |
| Kin | 30 | 5.61 (1.09) | 5.71 (1.01) | 5.66 (1.05) |
| Strangers | 30 | 2.88 (1.47) | 3.88 (1.50) | 3.37 (1.56) |

The results of the analysis revealed a significant main effect of relatedness on willingness to help, $F(1, 116) = 226.97$, $p < .001$, $d = 1.72$. Both men and women were more willing to give money to kin than strangers, regardless of scent condition. There was also a main effect of sex, $F(1, 116) = 9.05$, $p = .003$, $d = .55$. Women were more willing than men to give money to individuals in need, regardless of relatedness or scent. These main effects were qualified by a relatedness X sex interaction, $F(1, 116) = 8.82$, $p = .004$. Probing this interaction revealed that women were significantly more willing to give to strangers than were men, $F(1, 116) = 226.97$, $p < .001$, $d = .67$. Men and women did not differ in their

willingness to give to kin ($p > .60$) nor were there any further main effects or interactions between sex, scent, or relatedness (all $p$s > .30).

**Discussion.**

Study 1 confirmed the prediction that participants would be more willing to give to kin than to strangers. The effect was robust, and it was not affected by the food scent. Study 1 also confirmed the prediction that women would be more charitable than men in response to the lemon scent. Lemons are a gatherable resource, and women responded to cues of their presence with the tend-and-befriend strategy that characterizes the way in which they share resources. Although men and women both were more charitable toward kin than strangers, women showed more charitableness toward strangers than did men. This finding further reflects women's tend-and-befriend strategy, and it reflects men's tendency to restrict aid only to those who tend to reciprocate it.

## Study 2

Along with these confirmatory findings, Study 1 raised additional questions that must be addressed. In Study 1, I did not actively manipulate participants' perceptions of the availability of food resources. Instead, participants simply smelled food in the absence of other signs that the food was actually going to be widely available. Accordingly, it is possible that individuals differed in how they responded to the food cues based on their own perceptions of resource abundance or scarcity. In Study 2, I actively manipulated participants' perceptions of resource availability. I predicted that, regardless of any food

scents that were present, participants primed with scarce resource availability would give less to strangers than participants primed with abundant resource availability.

**Risk Reduction Reciprocity.**

Findings from fields outside of social psychology indicate that resource availability could be a key determinant of charitable behavior. Anthropologists and evolutionary biologists, for example, have long noted that perceptions of resource availability impact generosity. Trivers (1971) proposed that individuals are more likely to share during times of abundance than during times of scarcity because there is little cost and much potential gain associated with giving from a position of wealth. For instance, when a hunter returned to his community after killing a large buffalo, it would come at little cost to him to share his personal food abundance with his allies because the meat would likely spoil before he and his kin were able to consume it all. Sharing his wealth with his allies would thus be a low-cost way to increase the likelihood that others would help him if his own fortunes turned for the worse.

Indeed, anthropological field studies of meat-sharing behavior are consistent with this view (see e.g., Hawkes, et al., 2000). In non-food-storing, hunter-gatherer societies, individuals who make a large kill typically have more meat than they can eat or save, and they donate portions of their excess to others who have none. When those others make a kill, they do the same. In this way, the individuals collectively minimize the probability that they will go without meat for long periods of time. This has been dubbed the Risk Reduction Reciprocity (RRR) model (Bliege-Bird, et al., 2002).

The RRR model relies on the principle that, historically, the costs of sharing resources during times of widespread scarcity were far greater than the costs of sharing them

during times of widespread abundance. In times of widespread abundance, giving food aid to individuals in need would have come at little cost to oneself, even if the probability of reciprocation were relatively low. Food would have been widely available in these circumstances, and donors would have been easily able to find more. The costs of giving, though, would have been magnified during times of widespread scarcity because more food would not have been widely available.

Accordingly, aid would have been reserved for only those individuals who could benefit the donor by directly increasing the probability that the donor's genes would survive (e.g., by reciprocating the gift or by passing on the donors genes, such as what occurs when a donor's genetic relative survives). Thus, the model predicts that individuals will freely give resources to all who are in need during times of abundance. However, during times scarcity, individuals will give aid to kin but withhold it from non-kin recipients (for a comprehensive discussion of the rationale of these error management strategies, see Haselton & Buss, 2000).

**The Specificity of Scent.**

The manipulation of participants' perceptions of resource availability addresses one of the questions raised by Study 1. Another question raised by Study 1 is whether the sex-specific effects of the lemon scent could be repeated with a different scent. Previous studies have hinted at the possibility that very similar scents can impact behavior in very different ways. Imperceptible scents given off by humans, for example, can facilitate mating goals (Miller & Maner, in press), but they can also encourage the development of infant-caregiver relationships (Porter, 1998; Porter, Balogh, Cernoch, & Franchi, 1986).

Given the specificity of scent effects, then, participants in Study 1 could have responded as they did because the scent was general food scent, because it was a specific

food scent, or because it was a pleasant scent. To control for this possibility in Study 2, I used a new food scent ("vanilla caramel"), a true control (no scent), and an additional control scent that was a pleasant non-food scent ("sea island cotton"). I chose vanilla because it is a scent that is today associated with calorie-dense foods. Throughout human history, calorie-dense foods would have aided the survival of women of childbearing age (i.e., the age of most undergraduate college students), and women who hoarded these foods would have had adaptive advantages. Therefore, in contrast to Study 1 where women gave more freely in the presence of a food scent (lemon), I predicted that women would be less charitable than men in response to the vanilla scent.

**Method.**

***Participants.*** Participants were 186 men and 202 women recruited from the TCU undergraduate psychology participant pool ($M_{age}$ = 19.25).

***Design.*** The current experiment was a 3 (scent: food vs. pleasant non-food vs. no scent) X 2 (resources: abundant vs. scarce) X 2 (sex: male vs. female) X 2 (relatedness: kin vs. stranger) mixed-model design in which I measured participants' attitudes toward charitable giving and their willingness to donate to charity in a room scented with the target ambient scents. Scent, sex, and resource availability were between-subjects variables. Relatedness was a within-subjects variable.

***Procedure.*** The study was again conducted in a university computer lab and the scents were diffused in the same manner as in Study 1. Participants arrived in groups of 2-10, and they were directed to log into a computer. They began the experiment by completing a word-search puzzle. To reduce participants' suspicion of the true nature of the puzzles, participants were asked to find words related to office supplies (e.g., desk, table, computer,

etc.). In both the abundant and scarce conditions, there were additional words in the puzzle. Participants simply saw these words as they searched for the office supplies. In the abundant condition, the additional words were related to conditions of abundance (e.g., abundant, harvest, lush, etc.). In the scarce condition, the additional words were related to scarcity (e.g., scarce, famine, drought, etc.).[3]

After they completed the word search, the computer directed the participants to answer four questions that assessed their general willingness to give to charity: I am willing to give money to charity; I often give money to charity; it is important to give money to charity; I plan to give to charity in the future. The participants then read the scenarios from Study 1 and stated their willingness to give to the individuals in the scenarios using the same procedure as in Study 1. The participants then completed the demographic information from Study 1, and they were debriefed, thanked, and dismissed.

**Results.**

***Giving to general charitable causes.*** To test the effects of the target scent on individuals' overall willingness to give to general charitable causes, I first created a composite variable by averaging participants' scores on the four items that assessed their willingness to donate to charity ($\alpha = .84$). Next, I entered this composite into a 3 (scent: food vs. pleasant non-food vs. no scent) X 2 (prime: abundance vs. scarcity) X 2 (sex: male vs. female) between-subjects ANOVA. The results of this analysis revealed a main effect of sex

[3] I completed a pre-test to ensure that the puzzles effectively primed resource abundance and scarcity. Participants were randomly assigned to complete either the abundance or the scarcity puzzle. They then used Likert-type scales that ranged from 1-7 to assess the degree to which they believed resources to be widely available in the world today (1 = completely unavailable; 7 = totally available). The results of an independent samples t-test indicated that participants who completed the scarcity puzzle believed resources were significantly less available ($M = 2.95$; $SD = 1.50$) than did participants who completed the abundance puzzle ($M = 3.95$, $SD = 1.32$), $t(38) = 2.24$, $p = .031$.

on overall willingness to give to charity, $F(1, 376) = 12.85$, $p < .001$, $d = .38$ indicating that women ($M = 5.77$, $SD = .88$) were more willing to give than men (M = 5.41, $SD = 1.02$). The remaining main effects and interactions were non significant ($ps > .22$).

***Giving to kin versus strangers.***

*Willingness.* To test the effects of target scent on willingness to give to needy kin versus strangers, I first created two composite variables. The first of these variables was an average of the eight items that assessed the degree to which participants were willing to give money to kin ($\alpha = .72$). The second variable was an average of the eight items that assessed the degree to which participants were willing to give money to strangers ($\alpha = .75$). Next, the data were analyzed with a 2 (relatedness: kin vs. stranger) X 3 (scent: food vs. pleasant non-food vs. no scent) X 2 (prime: abundance vs. scarcity) X 2 (sex: male vs. female) mixed-model ANOVA. Relatedness was a within-subjects variable. Scent, prime, and sex were between-subjects variables. The dependent variable was willingness to give money to individuals in hypothetical scenarios. See Table 3 for the descriptive statistics.

**Table 3**

*Relatedness and Prime Influence Willingness to Give*

| | | *Kin* | *Strangers* | *Total* |
|---|---|---|---|---|
| | **N** | **M (SD)** | **M (SD)** | **M (SD)** |
| Abundance | 195 | 5.78 (1.13) | 3.73 (1.39) | 4.76 (.91) |
| Scarcity | 193 | 5.83 (1.06) | 3.41 (1.36) | 4.62 (.91) |

The analysis revealed a significant main effect of relatedness, $F(1, 376) = 664.99$, $p < .001$, $d = 1.79$. Replicating the results from Study 1, participants were more willing to give

to kin than to strangers. There were no additional significant main effects (*p*s > .14) but the results of the analysis indicated a relatedness X prime interaction, $F(1, 376) = 4.32$, p = .038. Further probing of this interaction revealed no significant differences in willingness to give to kin in response to the primes ($p = .68$). However, participants were less willing to give money to strangers after the scarcity prime than after the abundance prime, $F(1, 376) = 4.97$, p = .026, $d = .23$.[4] The remaining interactions were non significant (*p*s > .11).

*Amount.* To test the effects of target scent on willingness to give to needy kin versus needy strangers in hypothetical scenarios, I again created two composite variables. The first of these variables was an average of the eight items that assessed amount of money participants were willing to kin ($\alpha = .70$). The second was an average of the eight items that assessed amount of money participants were willing to give to strangers ($\alpha = .64$). The data were again analyzed with a 2 (relatedness: kin vs. stranger) X 3 (scent: food vs. pleasant non-food vs. no scent) X 2 (prime: abundance vs. scarcity) X 2 (sex: male vs. female) mixed-model ANOVA. Scent, prime, and sex were between-subjects variables. Relatedness was a within-subjects variable. The dependent variable was the amount of money (in dollars) participants were willing to donate in the hypothetical scenarios. See Table 4 for the descriptive statistics.

The main effect of prime and the main effect of scent were non significant (*p*s > .75). There was, however, a significant main effect of relatedness, $F(1, 376) = 733.79$, $p < .001$, $d = 2.13$. Participants were willing to give more money to kin than to strangers. There was also

[4]There was also a marginally significant relationship X smell X sex three-way interaction, $F(2, 376) = 2.69$, $p = .069$. However, further probing of this interaction revealed only significant simple effects that stemmed from relationship variable. Namely, male and female participants were more willing to give to kin and strangers across all three smell conditions (*F*s > 60, *p*s = .000).

a marginally significant main effect of sex on the amount participants were willing to give to those in need, $F(1, 376) = 2.99$, $p = .085$, $d = .18$. Across levels of scent and relatedness, men were willing to give more money than were women. The results also indicated that there was a relatedness X sex interaction $F(1, 362) = 6.80$, $p = .009$. Further probing revealed that men and women did not differ in the amounts they were willing to give strangers ($p = .40$), but men were willing to give significantly more money to kin than were women, $F(1, 362) = 5.99$, $p = .014$, $d = .25$.

**Table 4**

*Relatedness and Sex Influence the Amount Participants are Willing to Give*

| | | *Kin* | *Strangers* | *Total* |
|---|---|---|---|---|
| | **N** | **M (SD)** | **M (SD)** | **M (SD)** |
| Men | 177 | 55.06 (23.67) | 14.10 (12.97) | 69.16 (27.26) |
| Women | 197 | 49.14 (24.21) | 15.14 (12.85) | 64.29 (28.29) |

The analysis also yielded a relatedness X prime interaction, $F(1, 362) = 3.80$, $p = .052$. See Table 5 for the descriptive statistics. Further probing revealed that participants were willing to give similar amounts of money to kin after both the abundance and scarcity primes ($p = .36$). However, they were willing to give less money to strangers after the scarcity prime than after the abundance prime, $F(1, 362) = 5.50$, $p = .02$, $d = .25$.

There was also a scent X sex interaction $F(2, 362) = 3.25$, $p = .040$. Further probing of this interaction revealed a sex difference in response to the food scent, indicating that men were willing to give more money in response to the food scent ($M = 71.94$, $SD = 29.96$) than were women ($M = 59.48$, $SD = 25.89$), $F(1, 362) = 6.43$, $p = .012$, $d = .45$. However, for both

men and women, the simple effects tests revealed no significant differences between the food scent and non-food scent or between the non-food scent and no scent (*p*s > .10).

**Table 5**

*Relatedness and Prime Influence the Amount Participants are Willing to Give*

| | *Kin* | | *Strangers* | *Total* |
|---|---|---|---|---|
| | **N** | **M (SD)** | **M (SD)** | **M (SD)** |
| Abundance | 189 | 51.03 (24.42) | 16.24 (13.47) | 67.27 (28.59) |
| Scarcity | 185 | 52.06 (23.86) | 13.02 (12.00) | 65.08 (28.29) |

**Discussion.**

Consistent with prior findings, participants in Study 2 exhibited greater willingness to give to kin than strangers. Study 2 also demonstrated that perceptions of resource availability did not change participants' overall willingness to give to charity, but they did serve to narrow the pool of individuals to whom participants were willing to give. Confirming my hypothesis, participants remained equally willing to give to kin across availability conditions, but they were less willing to give to strangers when they were primed with resource scarcity relative to abundance.

A similar pattern of results was found for the amount of money that people were willing to give. As expected, participants were willing to give more money to kin than strangers, and this effect was magnified in response to cues to widespread resource scarcity. As in Study 1, the kin-stranger difference was larger for men than for women, providing additional evidence that men and women's giving strategies reflect strategies that have been adaptive for each sex through the majority of human history. That is, women seek to use their

available resources to make new allies (i.e., by giving to strangers), whereas men seek to use their resources to strengthen existing relationships (i.e., by giving to kin).

In addition, scent and sex interacted to influence charitable behavior. Confirming my hypothesis, women were willing to give less money in response to the scent of a high-calorie food than were men. I speculate that this finding may reflect a preference in women for calorie-dense food during childbearing years (i.e., the age of the participants), though further study and experimentation is necessarily before such a conclusion can be definitively reached.

## General Discussion

The results of the current research demonstrate that odor's relationship with prosocial behavior is both complex and varied. The first study demonstrated that women were more willing to give money to charity in the presence of a lemon scent compared to no scent, suggesting that scents of gatherable foods (e.g., lemons) may trigger charitable behavior women. The second study used the scent of a calorie-dense food (vanilla caramel) and showed the opposite result. Vanilla caramel made women *less* generous than men, suggesting that the scents of calorie-dense foods may not have the same effect in women as gatherable foods.

These results illustrate that the effects of food scents on prosocial behavior are both scent specific and sex specific. These effects can be linked to adaptive advantages that specific foods provided each sex throughout history (e.g., foods high in caloric value may have been more important to women's nutrition during childbearing years). Given the wide variety of possible food scents (e.g., meat, citrus, vegetable, cooked food, fresh food, etc.) and behaviors, the results of these current studies only begins to illustrate some of the scent-

specific and sex-specific effects of food scents on prosocial behavior. Future studies of food scents could examine the degree to which specific scents (e.g., meats, nuts, fruits, vegetables, etc.) influence a wide variety of behaviors (e.g., charity, attitudes, consumer behavior, etc.) in a wide variety of domains (e.g., a restaurant, a lab, etc.). Though there are undeniably many potentially confounding variables for which to control (e.g., scent intensity, individual differences, etc.), there is also a ripe field of findings ready to be harvested.

These findings also illustrate, though, that food scents are only one determinate of charitable behavior. Another clear pattern of results that emerge from this research was that individuals were much more willing to give money to kin in need than to strangers in need. Moreover, Study 2 showed that perceptions of resource scarcity interacted with relatedness to decrease willingness to give to strangers but not to kin. Although previous research has shown that individuals tend to be more willing to give aid to kin than to strangers (see e.g., Madsen et al., 2007; Maner & Gailliot, 2007; Stewart-Williams, 2007), Study 2 extends these findings by demonstrating that resource availability helps determine the magnitude of the difference in willingness to give to kin vs. strangers. Specifically, during times of scarcity, individuals appear to be most willing to give to those who are most likely to reciprocate the gift (kin) or whose survival directly benefits the genetic survival of the donor (kin). This pattern follows the logic of the RRR model and demonstrates that individuals' giving behavior follows adaptively relevant patterns that are uniquely sensitive to the relative abundance or scarcity of resources in the environment.

These results, however, may only begin to explain the complexity of the relationship between relatedness and resource scarcity. There are many degrees of relatedness (e.g., brother vs. uncle vs. offspring). There are also many degrees of resource availability (e.g.,

famine vs. minor shortage). Future studies could identify whether the degree of relatedness differentially influences giving when resources are scarce, and they could also examine the extent to which giving is influenced by relative degrees of scarcity and abundance.

Taken as a whole, the results of this investigation demonstrate what social psychology researchers have long known: People engage in prosocial behavior for a wide variety of reasons. Some may do it because of the benefits associated with giving (Griskevicius, Tybur, Sundie, Cialdini, Miller, & Kenrick, 2007; Hardy & Van Vugt, 2006; McMillen & Austin, 1971; Piliavin, 2003). Some may do it because they decide it is the rational thing to do (see e.g., Homans, 1958; Emerson, 1976), or because they feel compelled by society to give (Gouldner, 1960). This set of studies illustrates that some may even give because elements of their social context — scents, cues to resource availability, and recipient relatedness — activate innate behavioral tendencies that have been adaptive throughout human history. So although it may be easy to speculate about what drives Warren Buffett, and millions of other Americans, to give away valuable resources, it appears that the answer will always involve a complex array of factors that is only beginning to be fully understood.

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ABSTRACT

FOOD CUES, WIDESPREAD RESOURCE AVAILABILITY, AND KIN RELATIONSHIPS INFLUENCE CHARITABLE GIVING

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Decisions to donate to charity are influenced by a wide variety of factors. I hypothesized that four of these factors are ambient food odors, sex, donors' perceptions of the widespread availability of resources, and donors' perceptions of donor-recipient relatedness. The results of the first experiment (N = 60) revealed that participants were more willing to give to kin than to strangers. The results also indicated that food odors led women to be more willing than men to donate to charitable organizations in general. In Study 2 (N = 388), I actively manipulated participants' perceptions of the widespread availability of resources. The results suggested that perceptions of resource scarcity caused participants to hoard from strangers in need but not from kin in need.