

Does Sharing Food Influence Trust and Interdependence?

by

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ABSTRACT

Food-sharing is central to the human experience, involving biological and sociocultural functions. In small-scale societies, sharing food reduces variance in daily food-consumption, allowing effective risk-management, and creating networks of interdependence. It was hypothesized that trust and interdependence would be fostered between people who shared food. Recruiting 221 participants (51% Female, $M_{age} = 19.31$), sharing food was found to decrease trust and interdependence in a Trust Game with \$3.00 and a Dictator Game with chocolates. Participants trusted the least and gave the fewest chocolates when sharing food. Contrary to lay beliefs about sharing food, breaking bread with strangers may hinder rather than foster trust and giving in situations where competition over limited resources is salient, or under one-shot scenarios where people are unlikely to see each other again in the future.

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INTRODUCTION

Food insecurity has posed a major threat to the human life history (Kaplan, Hill, Lancaster, & Hurtado, 2000). People—and living organisms in general—need to secure sufficient calories that can be transformed into energy for growth, survival, and reproduction (Kaplan and Gangestad 2005). Attending to hunger alone, however, would have led to an evolutionarily unsuccessful psychology. Successful humans diverted time and energy towards physical safety, gaining status and affiliation, attracting and keeping mates, and taking care of their kin and offspring in addition to satisfying immediate physiological needs (Kenrick, Griskevicius, Neuberg, & Schaller, 2010). Diverting time and energy towards these challenges however requires further investments of time and energy to search, secure, and consume food. Securing sufficient calories would have therefore been crucial to successfully satisfying subsequent goals (e.g., affiliation, mating).

The human life history was characterized by high variance in food production; but comparatively smaller variance of food consumption (Kaplan et al., 2000). Differences in calories acquired to calories consumed can be in part explained by cooperative central food sharing (e.g., Gurven, 2006). A psychology that accurately evaluated current and future positive interdependence could have fostered trust among those who participated in central food-sharing; commensality in turn, may be an evolutionarily relevant behavior that cued a greater than non-zero probability of shared positive interdependence.

Food-Sharing is an Evolutionarily Effective Risk-Pooling Strategy

Compared to other primates humans exhibit the most frequent and flexible food sharing networks; yet recent experiments demonstrate that bonobos are also capable of spontaneous unidirectional transfers of food that occur even in the absence of requests from others (Krupenye, Tan, & Hare, 2018). Under naturalistic observations, wild-chimpanzees show increased levels of oxytocin after sharing food with kin and non-kin, suggesting that oxytocin may be a potential mechanism that facilitates bonding and cooperative food-sharing in primates (Witting, Crockford, Deschner, Langergraber, Ziegler & Zuberbühler, 2014).

The pervasiveness of food sharing among hunter-gather groups rests on the observations that sharing food widely and regularly ensures that variance of daily food consumption is reduced relative to what would be expected from rates of individual food production (Gurven, 2004; Gurven, Hill, Kaplan, Hurtado, & Lyles, 2000; Cronk et al., 2019). For example, Ache hunter-gatherers who share all types of food (e.g., honey, meat, fish) can consume up to 80% more calories than those who do not share food (Kaplan & Hill, 1985). Although food is shared widely between kin and non-kin, food transfers often favor family, neighbors, and those who reciprocate. Unsurprisingly, food transfers are often especially biased in favor of kin who reciprocate (Gurven, 2006).

Various proximate psychological mechanisms have been proposed to explain how people manage to secure sufficient calories, including mechanisms that facilitate cooperative strategies (e.g., reputation; Gurven, 2000; attending to the needs of others under the logic of risk-pooling; Sznycer & Delton et al., 2018), and mechanisms that facilitate or are counteradaptations to uncooperative strategies (e.g., tolerated theft; Bird,

1997; cheater-detection; Cosmides, Barret, & Tooby, 2010). The present work seeks to make sense and expand on previous literature on the psychology of food sharing in light of fitness interdependence theory.

Fitness Interdependence

Fitness interdependence is defined as the degree to which the outcomes of two or more organisms covary (Aktipis et al., 2018). Interdependence is a flexible construct, encompassing fitness-costly (e.g., zero-sum scenarios) as well as fitness-enhancing outcomes. Networks of food sharing can give rise to both negative interdependence (e.g., food is stolen, help is never returned even when other is able, competition over scarce resources), and positive interdependence (e.g., when people are in need and receive food from others, collective hunting or gathering).

Evolutionary perspectives of cooperative food sharing posit that natural selection will favor relatively simple rules of helping such as “share if other is kin” (Hamilton, 1964); “share if other is likely to share with me” (Trivers, 1971); or “share if other is in need, and I am able” (Aktipis, Cronk, & Aguiar, 2011; Aktipis et al., 2016; Smith et al., 2018; Sznycer & Delton et al., 2018). Accordingly, natural selection will design mechanisms that allow individuals to accurately make advantageous decisions for themselves, based on the available cues in their environment.

For instance, mechanisms that allow individuals to accurately discern kin from non kin (Lieberman, Tooby & Cosmides, 2007; Sznycer, De Smet, Billingsley & Lieberman, 2016), reciprocators from defectors (Cosmides et al., 2010) and generous from stingy others (e.g., Gurven, 2000). Fitness interdependence theory seeks to make

sense of these mechanisms of directed altruism and proposes that people may guide their behavior based on an underlying assessment of perceived fitness interdependence (i.e., “share with x, because x’s outcomes covary with my own outcomes”).

Trust

Trust is a psychological construct that involves aspects of the self (i.e., the trustor), the other (i.e., the trustee), and the specific situation in which individuals become interdependent. Situations that may foster trust also give rise to opportunities for defection (Simpson, 2007). In addition to its relevance for social interactions in everyday life, trust has been shown to be influenced by key life history traits. Namely, lower weight at time of birth is associated with lower trust during adulthood (Petersen & Aarøe, 2015). Even when trusting of others at the trait level may be low, people should be particularly inclined to signal trustworthiness in order to manipulate their interactions with others (Tooby & Cosmides, 1996). Within the context of food sharing networks, food transfers involve trusting that others will return the favor should one be in need in the future. Conversely, transferring food to others signals that one is trustworthy and will return the favor in the future (e.g., Gurven et al., 2000). In addition to food-transfers, the act of eating together may foster future—or strengthen current—trust and interdependence.

Food Sharing In Modern Ecologies

The pervasiveness of food sharing among hunter-gatherers rests on the observations that doing so reduces the variance in daily food consumption. Unlike

traditional small-scale societies, food in modern ecologies is often abundant, predictable, and easy to acquire. Thus, one may infer that in societies where variance in daily food consumption is low, people would engage in less food sharing, and would be less likely to foster positive interdependence via commensality. A recent study looking at data from 17 societies finds evidence that food sharing decreases in societies with animal husbandry, the ability to store food, and participate in market economies. In other words, reducing variance in daily food consumption decreases the extent to which people participate in daily food sharing (Ringen, Duda & Jaeggi, 2018).

In spite of these findings, in societies where agriculture, personalized food storage devices, and market exchanges are part of everyday life people still attribute a great deal of meaning to eating—especially eating with others. Meaning attributed to social eating in modern societies include forming a self-identity, distinguishing ingroups from outgroups, and building interpersonal trust (Fischler, 2011). People also report higher positive emotions when eating with others than when eating alone. In the same vein, people who eat with friends and family more frequently report higher life satisfaction and meaning in life compared to those who tend to eat meals alone (Dunbar, 2017). Moreover, adolescents and young adults report sharing meals with others to increase trust among friends, family, and members of new groups (Neely, Walton, & Stephens, 2014). Interestingly, many societies view eating alone as inherently strange, and may infer that solitary eaters are less trustworthy than people who eat in the company of at least one other person (Fischler, 2011). Lastly, food sharing may have effects beyond immediate interpersonal relationships. Qualitative work shows people are advised to share meals in order to achieve more successful negotiations (Graham and Lam 2003; Bernard, 2009).

And, firefighters who cook and eat together report greater cooperation and group work performance compared to firefighters who cooked and ate with their units less often (Kniffin, Wansink, Devine, & Sobal, 2015).

Impetus For Current Study and Hypotheses

Although behavioral ecologists have studied food-transfers in traditional small-scale societies for a long time, a series of studies have recently begun to experimentally investigate the effects of sharing food on trust, cooperation, and sociality more broadly in modern ecologies. For instance, infants expect friends and ingroup members (but not outgroup members) to share similar tastes in food. In contrast, infants expect people regardless of friendliness or ethnicity to have similar aversions to disgusting food, suggesting that intergroup biases in food consumption arise early in development (Lieberman, Woodward, Sullivan, & Kinzler, 2016). Corroborating previous qualitative work, Woolley and Fishbach (2019a) show that people with food restrictions feel lonelier than people with no restrictions due to their inability to consume similar foods with others. Relative to dissimilar food consumption, similar food consumption increases trust among strangers, and improves cooperation in a negotiation game (Woolley & Fishbach, 2017). Follow-up experiments find that in addition to similar food consumption, eating from the same bowl (compared to different bowls) leads to higher perceived coordination and cooperation in a negotiation game and an iterated prisoner's dilemma. Interestingly, these findings were not moderated by target type (i.e., stranger vs. friend) (Woolley & Fishbach, 2019b).

According to Woolley and Fishbach (2019b), food sharing leads to increases in trust and cooperation because people perceive greater coordination when eating the same food or eat from the same bowl. These types of commensality are thought to be one out of many possible situations that lead to increased coordination. Coordination, rather than sharing food, is thought to explain why people reported higher trust and improved cooperation. An alternative hypothesis based on the ecological rationality of food sharing and the logic of risk-pooling predicts that food specifically, rather than generic types of coordination, would lead to increases in trust, positive interdependence, and cooperative behavior. Across their studies, Woolley and Fishbach do not include a non-food sharing condition and are therefore unable to test the alternative hypotheses proposed in the present work:

H_{1a}: participants will show the most trust toward partners after sharing food.

H_{1b}: participants will give the most chocolates to partners after sharing food.

H₂: participants will report higher closeness and perceived interdependence after sharing food.

H_{3a}: increases in perceived interdependence, rather than increases in closeness, will mediate the effects of sharing food on trust and giving.

H_{3b}: the effect of food on giving will be mediated by increases in trust.

METHOD

Participants

An a priori power analysis with an alpha = .05, and power = .80 indicated that a sample size of $N = 250$ would be sufficient to detect a medium effect size of $R^2 = 0.15$ for

a four-group analysis of variance and their interaction. Thus, 250 undergraduates were recruited online in exchange for partial course credit and \$3.00 dollars. To mask the true purpose of the experiment, the study was advertised as a “Consumer goods, Consumer Satisfaction, and Social Relationships” study allegedly intended to measure the quality of a variety of consumer products. Based on a priori exclusion criteria, 11 participants were excluded for knowing their study partner prior to the experimental session, 17 indicated they did not understand the instructions of the Trust Game, and 1 participant correctly guessed the purpose of the study was to test how sharing influenced trust. Our effective sample size yielded an $N = 221$ participants (51% female, $M_{age} = 19.31$, $SD = 2.47$). The current study received approval from the Arizona State University Ethics Review Board.

Procedure

The current experiment employed a 2(Food/pencils) x 2(sharing/no sharing) between-subjects design. Two participants matched by sex were recruited per session and randomly assigned into one of the four conditions. A research assistant guided participants into a study room where participants sat face to face across a table, maintaining distance between participants in all study sessions constant. In the sharing pencils condition, participants were each given a box of coloring pencils and instructed to color on a sheet of paper. In the sharing pencils condition, only one box of coloring pencils set on the middle of the table was provided. In the no sharing food condition, each participant was given their own cookie (grams ~ 32). In the food sharing condition, participants were given only one equivalently larger cookie placed on the middle of the table (grams ~ 70) next to a pizza cutter. No instructions were given on how to cut or

share the cookie. In all conditions, participant interaction was set to two minutes. Research assistants stepped outside of the study room for the duration of the two minutes.

At two-minutes, the research assistant returned to the study room to instruct participants to complete a sham product survey in paper and pencil regarding their experience with the cookie or pencils. Immediately after completing the survey, the research assistant explained to participants they will again be paired with each other to complete a pilot study. One participant is instructed to remain in the study room and begin the second part of the study on a Laptop computer. The other participant was guided into a study room next door to complete the second part of the study also on a Laptop computer. Participants in all conditions played an investor game with \$3.00 dollars, where the money would be allegedly doubled, and decisions could be made to the cent (Figure 7) (Glaeser, Laibson, Scheinkman, & Soutter, 2000). I was only interested in measuring trust (i.e., amount transferred from player A to player B), rather than trustworthiness (amount transferred back from player B to player A), thus both participants assumed the role of player A (i.e., the investor).

After deciding how much to transfer to player B— but before receiving feedback on player's B response— participants completed a 6-item self-report measure of trust which asks to rate how likely their research partner is to possess traits such as trustworthiness and benevolence (1 = *Extremely unlikely*, 7 = *Extremely likely*). Participants then played a dictator game with 10 mini-chocolate candy bars, followed by the Inclusion of Other in the Self scale (Figure 8) (Aron, Aron, & Smollan, 1992), a set of closeness items reported in Wolley and Fischback (2017) (e.g., “how likable was the participant you were paired with” 1 = *Not at all*, 6 = *Extremely*), and the Perceived

Fitness Interdependence scale (e.g., “What is good for the participant I was paired with is good for me” 1 = *Strongly disagree*, 7 = *Strongly agree*) (Sznycer et al., in prep.). The presentation of scales and items within scales were randomized. Lastly, participants were asked to respond to a set of demographic questions (e.g., age, sex, SES), and questions aimed at measuring potential confounds (e.g., hunger, whether participants knew each other prior to the study). At the end of the session, a research assistant debriefed participants, explaining why minimal deception was necessary (i.e., that there was no player B, both assumed the role of player A).

RESULTS

Descriptives for age, sex, and variables of interest by condition are shown in Table 1. At the end of the study, participants reported how hungry they were prior to beginning the study (1 = *not at all*, 5 = *extremely*) and a research assistant coded whether participants talked during the study session (0 = did not talk during study, 1 = talked during study). Neither hunger or talking influence any of the dependent or potential mediating variables. Thus, hunger and whether participants talked during the study are excluded from all analyses.

Variable	Pencil No Sharing n = 57		Pencil Sharing n = 57		Cookie No Sharing n = 55		Cookie Sharing n = 52	
	M	SD	M	SD	M	SD	M	SD
Sex (male = 0)	27(freq.)	47.4(%)	27(freq.)	47.4(%)	28(freq.)	50.9(%)	27(freq.)	51.9(%)
Age	19.78	3.64	18.91	1.41	19.6	2.72	18.92	1.48
SES	5.07	2.75	5.37	2.75	6.38	2.60	5.16	2.44
Hunger	1.44	1.36	1.54	1.41	1.58	1.51	2.04	1.68
Talking (no = 0)	30(freq.)	52.6(%)	12(freq.)	21.1(%)	14(freq.)	25.5(%)	1(freq.)	1.9(%)
Closeness	1.77	1.25	2.04	1.20	2.02	1.13	1.88	1.06
Partner Evaluation	4.40	0.79	4.68	0.84	4.43	0.71	4.40	0.76
Interdep.	4.21	1.13	4.20	0.99	4.06	1.06	3.88	0.95
Trust	4.94	0.84	5.02	0.85	4.93	0.65	4.92	0.73
\$Invested	2.01	0.77	2.14	0.83	2.28	0.82	1.94	0.77
Chocolates Given	5.86	1.84	6.04	2.34	6.10	2.01	5.00	1.85

Table 1. SES reflects a composite average Z-score of parent’s combined annual income (1 = *Less than \$10,000*, 12 = *More than \$150,000*) and a three-item current SES scale (e.g., “I don’t need to worry too much about paying my bills,” 1 = *Strongly disagree*, 7 = *Strongly agree*).

H_{1a}: participants will show the most trust toward partners after sharing food.

The first hypothesis proposes that sharing food would increase trust and giving. Specifically, a main effect of food was expected such that trust and giving would be higher in the cookies relative to the pencils conditions, but no main effect of sharing was expected. A two-way interaction between food and sharing was expected, such that the effect of food on trust and giving would be higher in the sharing condition. A two-way ANOVA reveals no main effects of sharing ($F(1,217) = .12, p = .732$), food ($F(1,217) = .244, p = .732$), or a sharing \times food interaction on self-reported trust ($F(1, 217) = .222, p = .638$) (Figure 1).

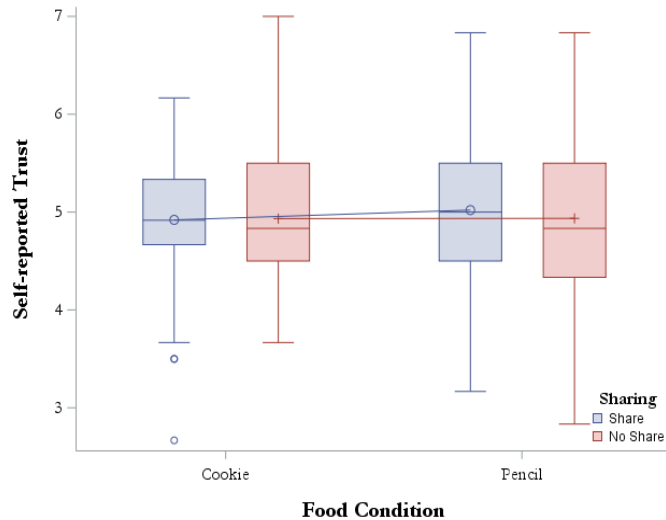


Figure 1. Box-plots of self-reported trust by condition.

The effect of sharing food on trust was also tested using amount invested in a Trust Game as the dependent variable. A two-way ANOVA again reveals no main effects of sharing ($F(1,217) = 1.072, p = .302$), or food ($F(1,217) = .102, p = .749$), however, the food \times sharing interaction is significant ($F(1,217) = 4.719, p = .031, \eta_p^2 = .021$). In contrast to the proposed hypothesis, pairwise comparisons reveal a significant difference between the food-sharing and food no-sharing conditions ($t(106) = 2.23, p = .026$), such that participants invested less on their partner when sharing food ($M = 1.94 [1.72, 2.16]$) than when eating food but not sharing ($M = 2.28 [2.07, 2.49]$). Although the main effect of food on investment is not significant, pairwise comparisons reveal a marginally significant effect of food in the expected direction ($t(106) = -1.77, p = .077$), such that participants invested slightly more in their partner in the cookie no-sharing condition ($M = 2.28 [2.07, 2.49]$) than in the pencils no-sharing condition ($M = 2.01 [1.81, 2.23]$) (Figure 2). All other pairwise comparisons p 's $> .19$.

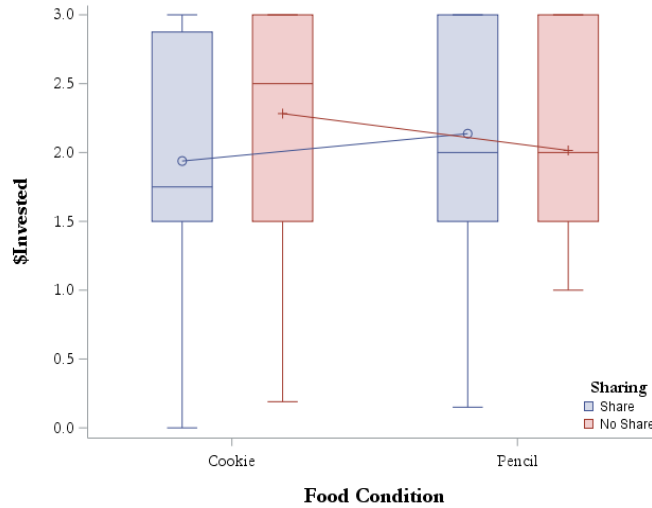


Figure 2. Box-plots of money invested in a \$3.00-dollar trust game by condition.

H_{1b}: participants will give the most chocolates to partners after sharing food.

In addition to increases in trust, a main effect of food on giving was expected, such that participants were predicted to give the most chocolates after sharing food. No main effect of sharing was expected, but a food \times sharing interaction was predicted, such that participants would give the most chocolates in the sharing food condition. A two-way ANOVA reveals no main effects of sharing ($F(1,197) = 2.61, p = .108$), or food ($F(1,197) = 1.96, p = .163$), but the food \times sharing interaction was significant ($F(1,197) = 4.98, p = .027, \eta_p^2 = .024$). Contrary to the proposed hypothesis, pairwise comparisons show that participants gave the least chocolates in the cookie-sharing condition ($M = 5.0$ [4.42, 5.58]), compared to the pencils no-sharing ($M = 5.86$ [5.30, 6.42], $t(98) = -2.12, p = .035$), the pencils-sharing ($M = 6.04$ [5.48, 6.59], $t(99) = -2.56, p = .011$), and the cookies no-sharing conditions ($M = 6.1$ [5.53, 6.66], $t(97) = -2.69, p = .007$). All other pairwise comparisons p 's $> .50$. (Figure 3).

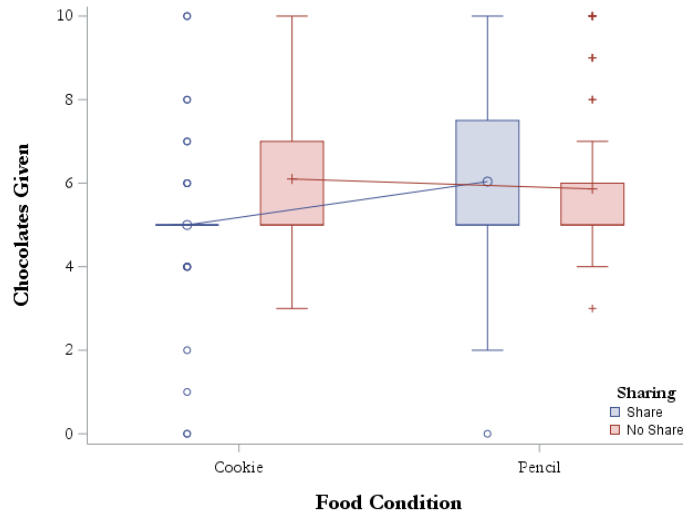


Figure 3. Box-plots of chocolates given in a dictator game with 10 candy bars by condition.

H₂: participants will report higher closeness and interdependence after sharing food.

The second hypothesis proposes that sharing food would increase closeness and interdependence. A two-way ANOVA reveals no main effects of sharing ($F(1,217) = .17$, $p = .679$), food ($F(1,217) = .09$, $p = .76$), or a food \times sharing interaction ($F(1,217) = 1.60$, $p = .21$) on closeness as measured by the Inclusion Of Other In The Self Scale (Figure 4).

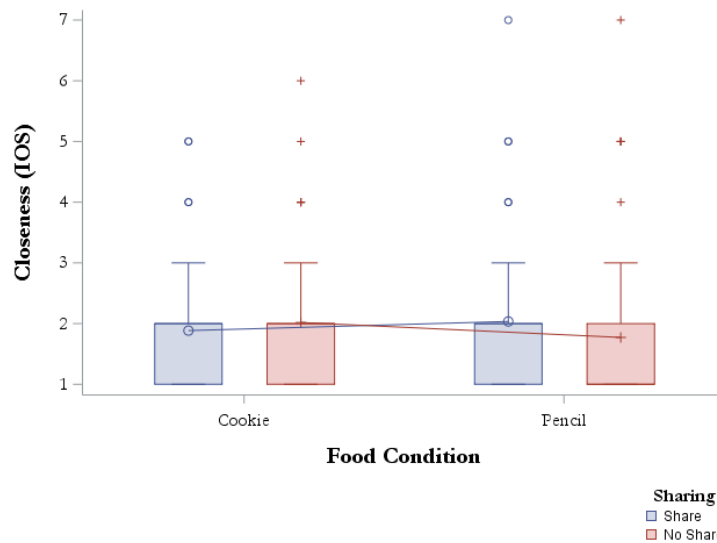


Figure 4. Box-plots of the Inclusion of Other in the Self scale by condition.

A similar pattern emerges for partner evaluation (i.e., closeness items reported in Woolley & Fishbach, 2017), such that a two-way ANOVA reveals no main effects of sharing ($F(1,216) = 1.33, p = .249$), food ($F(1,216) = 1.45, p = .229$), or a food \times sharing interaction ($F(1,216) = 2.13, p = .15$) (Figure 5).

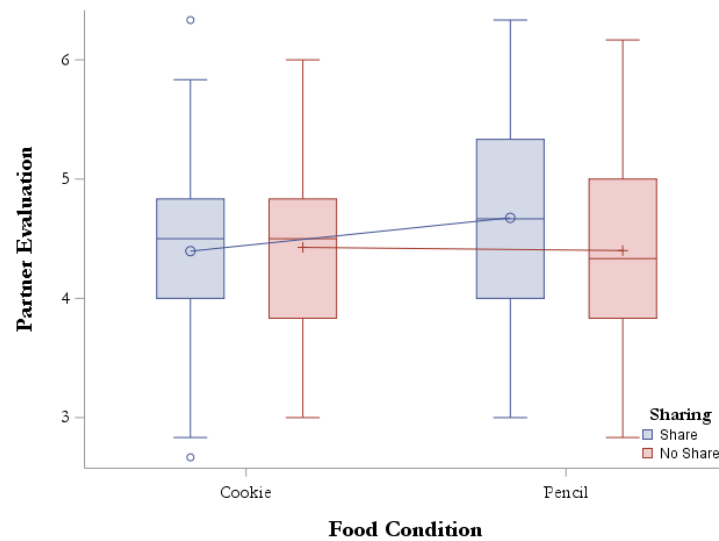


Figure 5. Box-plots of partner evaluation by condition.

A two-way ANOVA again reveals no main effects of sharing ($F(1,217) = .44, p = .51$), or a significant food \times sharing interaction ($F(1,217) = .36, p = .55$) on perceived interdependence. Contrary to the proposed hypothesis, I find a marginal negative main effect of food on interdependence ($F(1,217) = 2.95, p = .087, \eta_p^2 = .013$). Pairwise comparisons suggests participants reported slightly less perceived interdependence in the cookie conditions ($M = 3.97 [3.77, 4.17]$) than in the pencil conditions ($M = 4.21 [4.02, 4.40]$), $t(106) = 1.72, p = .087$) (Figure 6).

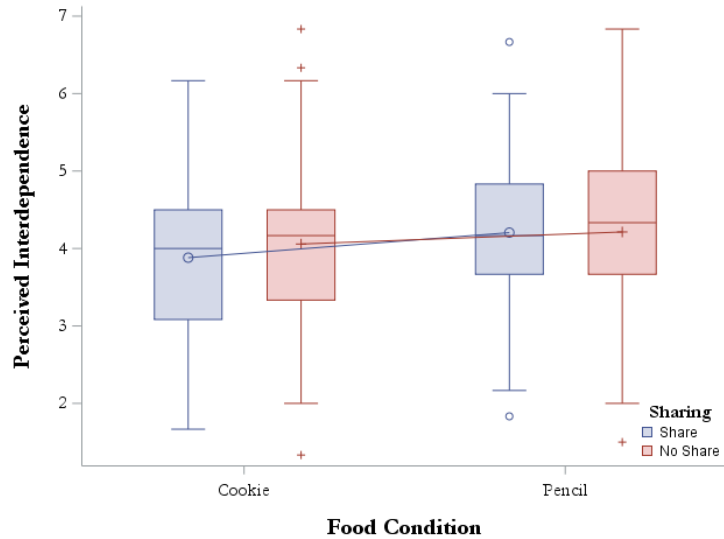


Figure 6. Box-plots of perceived interdependence by condition.

H₃: increases in perceived interdependence, rather than increases in closeness, will mediate the effects of sharing food on trust and giving.

The third hypothesis proposes that the effect of food on trust and giving would show a stronger mediated effect via perceived interdependence than via closeness. To test this prediction, the cookies sharing/no-sharing are collapsed into a food group, and the pencils sharing/no-sharing are collapsed into a pencils group (pencils = -1, cookies = 1). Table 2 shows bivariate regressions of the food condition on the three dependent variables: amount invested in the Trust Game, self-reported trust, and chocolates given; and on the proposed mediating variables: perceived interdependence, closeness (IOS), and partner evaluation. As shown in Table 2, there is no evidence for a potential mediated effect on either of the dependent variables. The food condition does not predict self-reported trust ($t(219) = -.49, p = .62$), amount invested in the trust game ($t(219) = 1.61, p = .11$), or chocolates given ($t(199) = -.135, p = .179$). Thus, food has no direct effect on

either trust or giving. The food condition also has no effect on closeness ($t(219) = .32, p = .751$), or partner evaluation ($t(219) = -1.19, p = .233$); and only a marginal negative effect on perceived interdependence ($b = -.112, t(219) = -1.7, p = .09$). Thus, food does not have an effect on either of the potential mediators.

DV: Trust	F(219)	b	t	p	95 CI		R²
Food	0.24	-0.025	-0.49	0.62	-0.128	0.076	0.001
Closeness (IOS)	12.73	0.155	3.57	< .001	0.069	0.241	0.055
Partner Evaluation	75.44	0.498	8.69	< .001	0.384	0.611	0.257
Interdependence	31.35	0.262	5.6	< .001	1.7	0.355	0.125
DV: \$ Invested	F(219)	b	t	p	95 CI		R²
Food	2.59	0.08	1.61	0.11	-0.018	0.186	0.011
Closeness (IOS)	1.1	0.049	1.05	0.296	-0.043	0.141	0.005
Partner Evaluation	1.66	0.089	1.29	0.2	-0.047	0.225	0.007
Interdependence	2.59	0.084	1.61	0.11	-0.018	0.186	0.011
DV: Chocolates	F(199)	b	t	p	95 CI		R²
Food	1.81	-0.195	-0.135	0.179	-0.481	0.09	0.009
Closeness (IOS)	0.21	-0.058	-0.45	0.651	-0.31	0.194	0.001
Partner Evaluation	0.58	0.143	0.76	0.445	-0.226	0.513	0.003
Interdependence	1.32	0.164	1.15	0.252	-0.118	0.447	0.006
	F(219)	b	t	p	95 CI		R²
Food on Closeness	0.1	0.035	0.32	0.751	-0.129	0.179	0.0004
Food on Evaluation	1.43	-0.06	-1.19	0.233	-0.167	0.041	0.006
Food on Interdep.	2.91	-0.112	-1.7	0.09	-0.256	0.018	0.013

Table 2. Bivariate regressions showing the effect of the food condition and potential mediators on self-reported trust, amount invested in the trust game, and chocolates given; and the effect of the food condition on closeness, partner evaluation, and interdependence.

H_{3b}: the effect of food on giving will be mediated by increases in trust.

The last hypothesis proposes to test a potential down-stream effect of food sharing. Specifically, the food condition is predicted to increase giving via a mediated

effect on trust. Tables 1 and 2 show the food condition has no direct effect on chocolates given. Bivariate regressions do show, however, a positive effect of self-reported trust ($b = .435$, $t(199) = 2.29$, $p = .023$), and trust as measured by the investor game ($b = .484$, $t(199) = 2.73$, $p = .007$) on chocolates given (Table 3). When both predictors are entered into a multiple linear regression, only amount invested in the trust game ($b = .408$, $t(198) = 2.29$, $p = .023$), but not self-reported trust ($b = .327$, $t(198) = 1.68$, $p = .095$) predict chocolates given (Table 4).

DV: Chocolates	<i>F</i> (199)	<i>b</i>	<i>t</i>	<i>p</i>	95 CI		<i>R</i> ²
Food	1.81	-0.195	-0.135	0.179	-0.481	0.09	0.009
Trust	5.22	0.435	2.29	0.023	0.059	0.811	0.025
Investor	7.45	0.484	2.73	0.007	0.134	0.834	0.04

Table 3. Bivariate regressions showing the effects of food condition, trust, and amount invested in the trust game on chocolates given.

DV: Chocolates	<i>b</i>	<i>t</i>	<i>p</i>	95 CI	
\$Investor	0.408	2.24	0.026	0.047	0.768
Trust	0.327	1.68	0.095	-0.057	0.711

$F(3, 198) = 5.17$,
 $p = .006$, $R^2 = .049$

Table 4. Multiple linear regression of self-reported trust and amount invested in the trust game as predictors of chocolates given.

DISCUSSION

Recent empirical work has begun to uncover how different types of commensality can influence trust, cooperation, and sociality more broadly. However, previous studies have neglected the possibility that sharing food in particular could explain why people report higher trust and improved cooperation when eating together. The current study

therefore tested whether sharing food influences trust and cooperation relative to eating together when there is no sharing, or when people share an item other than food. Commensality, but not sharing in general, was expected to increase trust, interdependence, and giving. And, importantly, people were expected to show the highest trust, interdependence, and most giving when made to share food prior to eating it together. In contrast, the current study finds that people trust less in a behavioral measure of trust (but not through self-report) and are least giving when they are made to share food prior to eating it together. Two complimentary explanations are offered to account for these unexpected findings.

Participants recruited were strangers at the time of the study session, and the study design employed one-shot cooperative scenarios (i.e., a one-shot Trust Game and a Dictator Game). Thus, on the one hand, participants may have little incentive in trusting strangers who they are unlikely to see again in the future. In addition, participants in the food-sharing condition were only given one cookie whereas participants in the food no-sharing were given one cookie each. Although cookies were roughly of equivalent weight, people are probably better at perceiving quantity than they are at perceiving weight. Thus, on the other hand, having to share a scarce food item with a stranger who one is unlikely to see again in the future could have led participants to trust their study partners less. Rather than cueing positive interdependence, the cookie-sharing condition could have alternatively cued negative situational interdependence (i.e., how much or how little of the cookie participants ate depended on how much the other one ate and vice-versa).

Limitations

A few limitations to the current study should be noted. First, while hunter-gatherers often share all types of foods widely, food that is most valuable due to high zero-return rates is shared most frequently. A cookie is probably not as highly coveted to undergraduates as meat or honey is to hunter-gatherers. Thus, the fact that the cookie conditions showed no main effects on closeness, interdependence, trust, or giving may be in part explained by participants attributing a low value to the cookies. If this were the case, however, sharing a more valuable food with a stranger may not eliminate or reverse the effect found in the current study but could also potentially exacerbate it (i.e., people may perceive more negative interdependence/competition, and be less trusting if made to share a more valuable food with a stranger under one-shot scenarios).

Second, to prevent participants from using their hands to cut the cookie, a pizza cutter was provided in the food-sharing condition. It is possible that participants may have perceived physical threat from having a sharp metal object in between them and a stranger. Lastly, food sharing and eating together may increase trust, giving, or interdependence when it is actively offered (i.e., directed food transfer or invitation to eating together). In the current study, the cookies were set on plates in the participant rooms moments prior to the study session.

Future Directions

Two potential manipulations/follow-up studies are proposed to try to replicate, and extend, current findings while also accounting for potential confounding variables. Study 2a) aims to manipulate perceptions of availability of food by adding two

conditions: an unlimited food no-sharing condition, and an unlimited food-sharing condition. Participants will be asked to answer measures of state zero-sumness as a manipulation check. This design will allow to test whether scarcity or competition over limited resources explains why people trusted their partner less when sharing food in the current study.

Study 2b) proposes to manipulate perceptions about the probability of encountering the study partner again in the future by adding again two conditions: a high probability for future encounter when sharing food, and a low probability for future encounter when sharing food. As a manipulation check, participants will be asked to rate how much they agree or disagree with the following statement: “It is unlikely that I will encounter the participant I was paired with again in the future” from 1 = *Strongly disagree*, to 7 = *Strongly agree*. In both studies 2a) and 2b), the cookie in the food-sharing conditions will be split prior to the study session to avoid the need of a pizza cutter, and thus rule out the possibility of a physical threat confound.

Conclusion

Natural selection does not operate on a void. Instead, natural selection operates on proximate mechanisms that orient the behavior of humans towards fitness maximizing goals (e.g., securing enough calories for oneself) (Tooby & Cosmides, 2015). Evidence advanced by behavioral ecologists provide an ultimate explanation; that people share food to reduce the variance in daily food consumption. The current study builds on this evidence and implements the framework of perceived fitness interdependence as a unifying proximate mechanism of directed trust and giving within the context of food sharing. Whereas the study design was intended to manipulate positive interdependence,

and in turn increase trust and giving, results suggests otherwise. The manipulation may have cued negative interdependence, in turn leading to less trust and less giving.

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<https://doi.org/10.1037/pspi0000223>

APPENDIX A
INFORMED CONSENT

Informed consent

Dear Prospective Participant,

I am a graduate student at Arizona State University currently conducting a marketing research project and I am inviting you to participate in this study.

Purpose: This study is part of a larger project investigating the relations between consumer goods, consumer satisfaction, and social relationships.

Procedures: If you choose to participate, you will be instructed to provide basic demographic information (e.g., age and sex), as well as answer four questionnaires. 1) The Toronto Empathy Questionnaire, 2) the Perceived Fitness Interdependence Scale, 3) the Willingness to Help in Times of Need Scale, and 4) the Inclusion of Other-In-The-Self Scale. You will also be asked to evaluate the quality of a product. Because we are interested in knowing how people rate their satisfaction with a wide variety of products, you will be randomly assigned to trying one of several products. You may be randomly assigned to rate your satisfaction with food (i.e., cookies). Therefore, you may not be eligible to participate if you are allergic to or cannot otherwise consume ingredients found in commonly available cookies. These ingredients include: Sugar, unbleached enriched flour, high oleic canola oil, palm oil, canola oil, cocoa, high-fructose corn syrup, baking soda, cornstarch, salt, soy lecithin, vanillin, and milk. There are no right or wrong answers, so please answer all questions as honestly and openly as possible. We anticipate the study will take between 20 and 30 minutes to complete.

Risks: This study involves minimal risk. That is, the risks involved in this study are no more than you would experience in regular daily activities. Your answers will be kept confidential to the extent allowed by law and no identifying information will be asked of you.

Benefits: You will be receiving .5 credit hours for your time, and up to \$3.00 dollars.

Data Collection & Storage: All data collected from you will be confidential to the extent allowed by law. There is no identifying information about you in the survey, and no such identifying information will be added later. Moreover, completed surveys will be kept on a secure, password-protected computer accessible only to me and Dr. Athena Aktipis. We'll never ask for your name or signature. Results will not be released or reported in any way that might allow for identification of individual participants.

Right to Refuse: You are free to answer only the questions you are comfortable with. Furthermore, your participation is strictly voluntary, and you are also free to withdraw from participation at any time without suffering any penalty.

Conflict of Interest: I do not have any financial (or otherwise) conflict of interest relating to subsequent results of this study.

Consent Statement: By continuing and completing the associated survey you certify that you are at least 18 years old, have carefully read this consent form, have no health restrictions regarding the ingredients mentioned above, and agree to participate in this research study. You also understand that you are free to withdraw from this study at any time.

If you have additional questions, please contact me (Diego Guevara Beltrán) at dguevar3@asu.edu or Dr. Athena Aktipis at aktipis@asu.edu. If you have questions about the rights of human research participants contact the ASU IRB Office at (480) 965-6788 or research.integrity@asu.edu.

Sincerely,
Diego Guevara Beltrán
Psychology Graduate Student,
Arizona State University

APPENDIX B
SURVEY ITEMS

Instructions

[one of these instructions will be read by the research assistant following consent depending on the condition randomly assigned]

No sharing food condition

Let me tell you a little about the two studies you'll be participating in. In the first, we're looking for evaluations and impressions of foods as part of a marketing research project. You'll be assigned to evaluate a brand of cookies. Cookies will be placed on either side of the table. You may eat as little or as much as you'd like, but make sure you try the cookie at least once. In the second part, you'll be paired with a student to complete a pilot study we're testing.

Sharing food condition

Let me tell you a little about the two studies you'll be participating in. In the first, we're looking for evaluations and impressions of foods as part of a marketing research project. You'll be assigned to evaluate a brand of cookies. A cookie will be placed at the center of the table with a pizza cutter. You may eat as little or as much as you'd like, but make sure you try the cookie at least once. In the second part, you'll be paired with a student to complete a pilot study we're testing.

No sharing pencil condition

Let me tell you a little about the two studies you'll be participating in. In the first, we're looking for evaluations and impressions of coloring pencils as part of a marketing research project. Coloring pencils will be placed on either side of the table, and you'll be asked to color on a sheet of paper. You may color as little or as much as you'd like, but

make sure you try at least a pencil once. In the second part, you'll be paired with a student to complete a pilot study we're testing.

Sharing pencil condition

Let me tell you a little about the two studies you'll be participating in. In the first, we're looking for evaluations and impressions of coloring pencils as part of a marketing research project. A set of coloring pencils will be placed at the center of the table and you'll be asked to color on a sheet of paper. You may color as little or as much as you'd like, but make sure you try at least a pencil once. In the second part, you'll be paired with a student to complete a pilot study we're testing.

[Research assistant guides participants to testing room, and instructs participants to let her know when they are done with the product experience survey]

[Participants are sat, try the cookie/pencil, and complete survey]

Food evaluation form (Wolley and Fischback, 2017):

How much do you like the way this food tastes?

0 (not at all) 1 2 3 4 5 (very much)

How often do you eat this type of snack?

0 (never) 1 2 3 4 5 (very often)

How likely are you to buy this food next time you are in the store?

0 (not at all) 1 2 3 4 5 (very likely)

Pencil evaluation form (adapted from Wolley and Fischback, 2017):

How much do you like this type of pencil?

0 (not at all) 1 2 3 4 5 (very much)

How often do you use coloring pencils?

0 (never) 1 2 3 4 5 (very often)

How likely are you to buy this kind of pencil next time you are in the store?

0 (not at all) 1 2 3 4 5 (very likely)

[Participants instruct the research assistant when they are finished. Research assistants will use the following script when guiding participants]

Now we will go into a separate room where you will complete the second study. Let me show you where that is.

Investor Game (Glaeser et al., 2000)

In this study, both of you will assume different roles: one an investor, the other a fund-manager. The investor will be given \$3. He or she can choose to 'invest' any proportion of this amount with the fund-manager, and keep the remainder for him or herself. For example, the investor may keep \$1.00, investing \$2.00 with the fund-manager. The amount invested is doubled when it reaches the fund-manager (becoming \$4.00 in this example). The fund-manager can divide this new amount between him or herself and the investor however they want: they can take everything, nothing, or any proportion of the new amount. You have been randomly assigned to play the role of the investor. The other participant will be playing as the fund-manager.

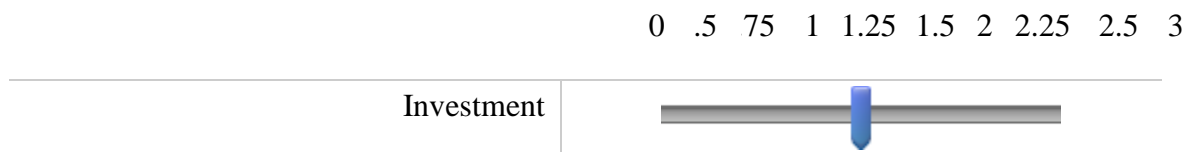


Figure 7. Investment decisions were made on a toggle bar ranging from 0 to 3. Decisions can be made to the cent.

Comprehension check

Did you understand the instructions of the investor game?

Yes
No

Self-report Trust Scale

How likely would you say it is that the following traits or behaviors describe the participant you were paired with?

Benevolent

0 (extremely unlikely) 1 2 3 4 5 6 (extremely likely)

Has Integrity

0 (extremely unlikely) 1 2 3 4 5 6 (extremely likely)

Has the ability to be trustworthy

0 (extremely unlikely) 1 2 3 4 5 6 (extremely likely)

Is trustworthy

0 (extremely unlikely) 1 2 3 4 5 6 (extremely likely)

If you loaned him/her money, you would expect to get it back

0 (extremely unlikely) 1 2 3 4 5 6 (extremely likely)

Can be trusted with a sensitive secret

0 (extremely unlikely) 1 2 3 4 5 6 (extremely likely)

Closeness/Interdependence items (Wolley and Fischback, 2017)

How likable was the person you were paired with?

0 (not at all) 1 2 3 4 5 6 (extremely)

I would like to spend more time with the person I was paired with

-3 (disagree) -2 -1 0 1 2 3 (agree)

I do not see myself being friends with that person

-3 (disagree) -2 -1 0 1 2 3 (agree)

The person I was paired with seemed dishonest

-3 (disagree) -2 -1 0 1 2 3 (agree)

I could probably work well with the person I was paired with

-3 (disagree) -2 -1 0 1 2 3 (agree)

Inclusion of Other in the Self scale (Aron, Aron, and Smollan 1992)

Please indicate the number that best describes your current relationship with the other participant in this study.

1 2 3 4 5 6 7

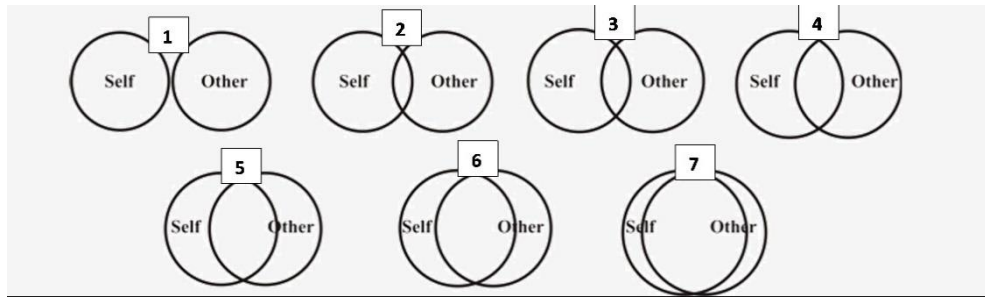


Figure 8. Inclusion of Other in the Self scale.

Perceived Fitness Interdependence (Sznycer et al., under review)

The following questions range from 1 (Do not agree at all) to 7 (Strongly agree).

When the other participant in this study succeeds, I feel good.

1 2 3 4 5 6 7

When the other participant in this study fails, I feel bad.

1 2 3 4 5 6 7

I feel that the other participant's gain is my gain.

1 2 3 4 5 6 7

What is good for the other participant in this study is good for me.

1 2 3 4 5 6 7

Honestly, I don't care whether the other participant in this study thrives or not.

1 2 3 4 5 6 7

The other participant in this study and I rise and fall together.

1 2 3 4 5 6 7

The Toronto Empathy Questionnaire (Spreng et al., 2009)

Below is a list of statements. Please read each statement carefully and rate how frequently you feel or act in the manner described. There are no right or wrong answers or trick questions. Please answer each question as honestly as you can.

When someone else is feeling excited, I tend to get excited too
Never Rarely Sometimes Often Always

Other people's misfortunes do not disturb me a great deal
Never Rarely Sometimes Often Always

It upsets me to see someone being treated disrespectfully
Never Rarely Sometimes Often Always

I remain unaffected when someone close to me is happy
Never Rarely Sometimes Often Always

I enjoy making other people feel better
Never Rarely Sometimes Often Always

I have tender, concerned feelings for people less fortunate than me
Never Rarely Sometimes Often Always

When a friend starts to talk about his/her problems, I try to steer the conversation towards something else
Never Rarely Sometimes Often Always

I can tell when others are sad even when they do not say anything
Never Rarely Sometimes Often Always

I find that I am "in tune" with other people's moods
Never Rarely Sometimes Often Always

I do not feel sympathy for people who cause their own serious illnesses
Never Rarely Sometimes Often Always

I become irritated when someone cries
Never Rarely Sometimes Often Always

I am not really interested in how other people feel
Never Rarely Sometimes Often Always

I get a strong urge to help when I see someone who is upset
Never Rarely Sometimes Often Always

When I see someone being treated unfairly, I do not feel pity very much for them

Never Rarely Sometimes Often Always

I find it silly for people to cry out of happiness

Never Rarely Sometimes Often Always

When I see someone being taken advantage of, I feel kind of protective towards him/her

Never Rarely Sometimes Often Always

The Toronto Empathy Questionnaire (adapted from Spreng et al., 2009)

Below is a list of statements. Please read each statement carefully and rate how frequently you would feel or act in the manner described with regards to the other participant in this study. There are no right or wrong answers or trick questions. Please answer each question as honestly as you can.

If the other participant felt excited, I would tend to feel excited too

Never Rarely Sometimes Often Always

The other participant's misfortunes would not disturb me a great deal

Never Rarely Sometimes Often Always

It would upset me to see the other participant being treated disrespectfully

Never Rarely Sometimes Often Always

I would remain unaffected if the other participant were happy

Never Rarely Sometimes Often Always

I would enjoy making the other participant feel better

Never Rarely Sometimes Often Always

I would have tender, concerned feelings for the other participant if he/she were less fortunate than me

Never Rarely Sometimes Often Always

If the other participant were to talk about his/her problems, I would try to steer the conversation towards something else

Never Rarely Sometimes Often Always

I would be able to tell if the other participant was sad even if he/she did not say anything

Never Rarely Sometimes Often Always

I find that I would be "in tune" with the other participant's moods

Never Rarely Sometimes Often Always

I would not feel sympathy for the other participant if he/she were to cause his/her own serious illness

Never Rarely Sometimes Often Always

I would become irritated if the other participant were to cry

Never Rarely Sometimes Often Always

I am not really interested in how the other participant feels

Never Rarely Sometimes Often Always

I would get a strong urge to help if I were to see the other participant being upset

Never Rarely Sometimes Often Always

If I were to see the other participant being treated unfairly, I would not feel very much pity for him/her

Never Rarely Sometimes Often Always

I would find it silly if the other participant were to cry out of happiness

Never Rarely Sometimes Often Always

If I were to see the other participant being taken advantage of, I would feel kind of protective towards him/her

Never Rarely Sometimes Often Always

Willingness to Help in Times of Need (Sznycer et al., in prep)

The following questions range from 1 (Do not agree at all) to 7 (Strongly agree).

During a winter storm, the other participant in this study knocks on your door because

1 2 3 4 5 6 7

his/her heating is out. How willing would you be to let him/her sleep in your living room for the night?

1 2 3 4 5 6 7

The other participant in this study has no water in his/her house. How willing would you be to fill his/her jugs with water from your tap?

1 2 3 4 5 6 7

The other participant's house in this house is being fixed, so it isn't livable. How willing would you be to let him/her move into your house for a week?

1 2 3 4 5 6 7

How willing would you be to help the other participant in this study move boxes to his/her new apartment?

1 2 3 4 5 6 7

How willing would you be to lend \$100 to the other participant in this study?

1 2 3 4 5 6 7

How many favors have you done for the other participant in this study in the last two months?

1 2 3 4 5 6 7

If the other participant in this study needed a kidney, how willing would you be to donate a kidney to him/her?

1 2 3 4 5 6 7

End of study questions: all conditions

Were you hungry at the time the study began?

0 (not at all) 1 2 3 4 5 (very)

How long ago was your last meal?

Less than an hour ago

1-2 hours ago

3-4 hours ago

More than 4 hours ago

Did you know the participant you were paired with prior to the study?

Yes

No

What did you think the purpose of the study was before playing the investment game?

[text box for free response]

What did you think the purpose of the study was after playing the interment game? Skip if same as before

[text box for free response]

End of Study Questions (food conditions only)

Did you or the other participant cut the cookie?

I did

The other did

Did you cut the cookie evenly in half?

Yes

No

I tried

Did the other cut the cookie evenly in half?

Yes

No

I think he/she tried to

Did you hand the other his/her piece of the cookie?

Yes

No, he/she reached for his/her own piece

Did the other hand you your piece of the cookie?

Yes

No, I reached for my own piece

Please specify how much of your cookie(s) you ate (e.g., all, half, one bite, etc.)

[text box for free response]

End of Study Questions: pencil conditions only

Did you reach for the coloring pencil first?

Yes

No, the other participant did

Did you take pencils for yourself first or handed some to the other before taking your own?

I took mine first

I gave some to the other first

Did the other take pencils for his/herself first or did he/she handed some to you before taking his/her own?

The other took some for him/herself first

The other handed me some first

Demographics

What is your biological sex?

Male

Female

What is the highest level of education you have obtained?

Less than high school degree

High school graduate (diploma or equivalent including GED)

Some college but no degree

Associate degree (or two years of college)

Bachelor's degree (4 years of college)

Master's degree
Doctoral or professional degree (e.g., PhD, JD, MD)

What is your ethnicity?

White
Black or African American
Native American
Asian
Other

Information about income is very important to understand. Would you please give your best guess? Please indicate the answer that includes your entire household (i.e., parents') income in (previous year) before taxes.

Less than \$10,000
\$10,000 - \$19,999
\$20,000 - \$29,999
\$30,000 - \$39,999
\$40,000 - \$49,999
\$50,000 - \$59,999
\$60,000 - \$69,999
\$70,000 - \$79,999
\$80,000 - \$89,999
\$90,000 - \$99,999
\$100,000 - \$149,999
More than \$150,000

Childhood stability

My family life was stable growing up

1(Strongly disagree) 2 3 4 5(Strongly Agree)

Growing up, I always knew where my next meal was coming from

1(Strongly disagree) 2 3 4 5(Strongly Agree)

As a child, my daily routine was predictable

1(Strongly disagree) 2 3 4 5(Strongly Agree)

My mother switched jobs a lot when I was growing up

1(Strongly disagree) 2 3 4 5(Strongly Agree)

My father switched jobs a lot when I was growing up

1(Strongly disagree) 2 3 4 5(Strongly Agree)

My family rarely moved when I was a child

1(Strongly disagree) 2 3 4 5(Strongly Agree)

My mother had a lot of different boyfriends when I was growing up
1(Strongly disagree) 2 3 4 5(Strongly Agree)

My father had a lot of different girlfriends when I was growing up
1(Strongly disagree) 2 3 4 5(Strongly Agree)

People I was not related to (i.e., not family) moved in and out of where I was growing up
1(Strongly disagree) 2 3 4 5(Strongly Agree)

Childhood SES (Griskevicius et al., 2010)

My family usually had enough money for things when I was growing up
1(Strongly disagree) 2 3 4 5 6 7 8 9 (Strongly agree)

I grew up in a relatively wealthy neighborhood
1(Strongly disagree) 2 3 4 5 6 7 8 9 (Strongly agree)

I felt relatively wealthy compared to the other kids in my school
1(Strongly disagree) 2 3 4 5 6 7 8 9 (Strongly agree)

Current SES (Griskevicius et al., 2010)

I have enough money to buy the things I want
1(Strongly disagree) 2 3 4 5 6 7 8 9 (Strongly agree)

I don't need to worry too much about paying my bills
1(Strongly disagree) 2 3 4 5 6 7 8 9 (Strongly agree)

I don't have to worry about money too much in the future
1(Strongly disagree) 2 3 4 5 6 7 8 9 (Strongly agree)

Participant comments

Please leave any comments, questions, or criticisms you may have about the current study

[text box]

End of study.

APPENDIX C
IRB APPROVAL

APPROVAL: EXPEDITED REVIEW

C Athena Aktipis
 Psychology
aktipis@asu.edu

Dear C Athena Aktipis:

On 11/2/2018 the ASU IRB reviewed the following protocol:

Type of Review:	Initial Study
Title:	Food sharing, Cues of Cooperation, and Interdependence
Investigator:	C Athena Aktipis
IRB ID:	STUDY00008951
Category of review:	(5) Data, documents, records, or specimens
Funding:	Name: Psychology
Grant Title:	
Grant ID:	
Documents Reviewed:	<ul style="list-style-type: none"> • Consent form-Sona.pdf, Category: Consent Form; • CITI-DiegoGB, Category: Other (to reflect anything not captured above); • Willingness to Help (food).pdf, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions); • study instructions.pdf, Category: Participant materials (specific directions for them); • IOS scale (food).pdf, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions); • PROTOCOL food sharing.docx, Category: IRB Protocol; • Debriefing.pdf, Category: Recruitment materials/advertisements /verbal scripts/phone scripts; • Recruitment-Sona.pdf, Category: Recruitment Materials; • TEQ-original (food).pdf, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions); • PFI (food).pdf, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions);

The IRB approved the protocol from 11/2/2018 to 11/1/2023 inclusive. Three weeks before 11/1/2023 you are to submit a completed Continuing Review application and required attachments to request continuing approval or closure.

If continuing review approval is not granted before the expiration date of 11/1/2023 approval of this protocol expires on that date. When consent is appropriate, you must use final, watermarked versions available under the “Documents” tab in ERA-IRB.

In conducting this protocol you are required to follow the requirements listed in the INVESTIGATOR MANUAL (HRP-103).

Sincerely,

IRB Administrator

cc: Diego Guevara Beltran
C Athena Aktipis
Corrie Whisner
Jaimie Krems
Diego Guevara Beltran