



## Supporting Online Material for

### **Spending Money on Others Promotes Happiness**

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## Supporting Online Material

### Materials and Methods

#### Correlational Study

##### *Participants and Design*

A total of 287 males and 345 females answered our questions as part of a larger, online survey, in return for points that could be redeemed for prizes.

##### *Materials and Procedure*

Participants rated their general happiness by answering the question "Do you feel happy, in general?" and selecting from five possible responses (no, rarely, sometimes, most of the time, yes), which we scored from 1-5, such that higher numbers indicate greater happiness. Responses to this question have been shown to correlate strongly with scores on the 29-item Oxford Happiness Inventory (*S1*) and to exhibit high test-retest reliability, as well as good convergent and divergent validity (*S2*). Because this single-item measure originally used an 11-point response scale whereas we used a 5-point scale, we conducted additional validation of our measure; in a separate study, we asked a nationally representative sample of 321 participants (46% female) to complete another widely-used, four-item measure of general happiness, the Subjective Happiness Scale (*S3*), as well as our single-item measure. As expected, the multi-item measure ( $\alpha = .82$ ) was highly correlated with our single-item measure,  $r(321) = .71, P < .001$ , offering support for the validity of our measure. These results are consistent with the emerging perspective that single items can provide a sufficiently valid measure of happiness when minimizing participant burden is desirable (*S4*).

In using this operational definition of happiness, the present work dovetails with the dominant approach in the extant literature, in which individuals are asked to make a broad, summary evaluation of their overall happiness across an extended period (from a day to a lifetime). This approach can be distinguished from an alternative approach examining "experienced" or "objective" happiness, in which individuals are asked to report the transient emotions they experienced at many different moments in time (*S5-S7*).

Participants selected their personal income category from 6 options: less than \$20,000, \$20,000-\$35,000, \$35,001-\$50,000, \$50,001-\$65,000, \$65,001-\$80,000, \$80,001+.

Because the correlational design of this first study does not permit causal inferences about the relationship between spending choices and happiness, it is plausible that an unmeasured third variable, such as materialism (i.e., valuing financial success and material possessions; *S8-S10*), could underlie the observed correlation between prosocial spending and happiness. Indeed, previous research demonstrates that high materialism is associated with both lower happiness (*S11*) and with spending more on oneself and less on friends, family, and charitable donations (*S12*). Notably, the relationship between prosocial spending and happiness in our study emerged even controlling for personal spending, which should also be associated with materialism. More importantly, the final two investigations we report use alternative methodologies – including an experimental design – to address this third variable problem and provide converging evidence for the causal impact of prosocial spending on happiness.

### *Regression Diagnostics*

We ran additional regression diagnostics using ARC (version 1.06), as well as SPSS (version 14.0). First, a Loess regression confirmed that the relationship between prosocial spending and happiness is linear, rather than curvilinear (Figure S1). Second, we found some evidence that our data did not meet the assumptions of homoscedasticity [Score Test:  $N = 632$ ,  $X^2(1) = 5.18$ ,  $P < .02$ ) and normality of errors (Figure S2); violations of these assumptions can be dealt with by using bootstrapping procedures, which do not assume a normal distribution. Using this bootstrapping approach, we found that the critical effect of prosocial spending remained significant; that is, the 95% confidence interval for the prosocial spending coefficient did not cross zero, confirming the key finding of our regression analysis.

Next, we assessed the extent to which our findings might be driven by a few extreme observations. There were no truly extreme outliers in the multivariate space, taking into account the large sample size (Figure S3). Still, we removed two observations that were marked by the highest Cook's  $d$  scores and therefore had the greatest influence on the results. After deleting these data points, we found that the effect of prosocial spending on happiness remained significant, [ $\beta = .09$ ,  $P < .04$ ]. We also tried deleting three data points that were marked by high leverage (this included the two data points that were high in influence, as well as a third data point that was high in leverage, but not influence); again, the critical effect of prosocial spending was largely unchanged, [ $\beta = .09$ ,  $P < .04$ ].

### *Correlations and Multicollinearity*

The complete correlation matrix for this study is provided in Table S1. To examine whether multicollinearity posed a threat to our main regression analyses, we examined variance inflation factors (VIF), the primary diagnostic SPSS provides to test whether the degree of multicollinearity in the predictors of a regression analysis will interfere with the interpretation of the regression. Multicollinearity is typically considered a problem when VIF's are greater than 10 (S13, S14). VIF's in this study ranged from 1.08 to 1.27, suggesting that the degree of multicollinearity in our data does not pose a threat to the interpretation of our regression analyses.

## **Longitudinal Study**

### *Participants and Design.*

Three female and thirteen male employees at a Boston-based company completed this study in return for a chance to win gift certificates to local restaurants.

### *Materials and Procedure.*

Participants rated their general happiness on the same scale used in the previous study, both before and after receiving their bonus, such that these measurement occasions were separated by approximately 3 months; pre-windfall happiness and post-windfall happiness were moderately correlated ( $r = .29$ ).

In addition to reporting what percentage of their bonus they devoted to our theoretically-relevant categories, participants reported how much of their bonus they had

devoted to anything else. Entering pre-windfall happiness and spending on this “other” category ( $M = 14.38$ ,  $SD = 28.45$ ) into a regression predicting post-windfall happiness revealed no significant relationship between “other” spending and post-windfall happiness ( $\beta = .09$ , NS). In total, summing across all categories, participants reported having spent the vast majority of their bonus ( $M = 90.00$ ,  $SD = 17.22$ ) by Time 2.

### *Regression Diagnostics*

Conducting the same diagnostic tests as in the correlational study, we found some potential curvature using a Loess regression (Figure S4). Thus, we would hesitate to rule out the possibility that there is some degree of curvilinearity in the relationship between prosocial spending and happiness, though we see no evidence of this in the correlational study. Our next tests demonstrated that our longitudinal data met the assumptions of homoscedasticity [Score Test:  $N = 16$ ,  $X^2(1) = .54$ , NS] and normality of errors (Figure S5); we conducted a bootstrapping analysis nonetheless, which confirmed that the 95% confidence interval for the effect of prosocial spending on happiness did not cross zero, consistent with the basic regression analysis.

We did not find clear evidence of extreme outliers, though of course identifying outliers is challenging with a small sample size (Figure S6). Still, we tried deleting two cases that were marked by both the highest influence and the highest leverage; with these cases removed, the critical effect of prosocial spending on happiness remained significant, [ $\beta = .85$ ,  $P < .01$ ], suggesting that our effect was not driven by a few extreme observations.

### *Correlations and Multicollinearity*

The complete correlation matrix for this study is provided in Table S2; as with the correlational study, variance inflation factors—which in this study ranged from 1.04 to 3.04—indicated that multicollinearity did not pose a serious threat to the interpretation of our regressions. Consistent with results from the correlational study, Time 1 happiness and prosocial spending are positively correlated. Importantly for our argument, though, even when we control for Time 1 happiness in our regressions, we observe a positive relationship between bonus spending and Time 2 happiness, demonstrating an additional impact on happiness from spending the bonus prosocially.

Given that the correlation between Time 1 happiness and prosocial spending was stronger than the correlation between Time 1 and Time 2 happiness, it is possible that Time 1 happiness could act as a suppressor variable (S15). Indeed, inclusion of Time 1 happiness in the regression analysis strengthens the relationship between prosocial spending and Time 2 happiness somewhat. However, supporting our key finding, the effect of prosocial spending on Time 2 happiness remains significant when we omit Time 1 happiness [ $\beta = .60$ ,  $P < .05$ ].

## Experimental Study

### *Participants and Design.*

Forty-six participants (74% female) completed both phases of this study; three additional participants completed the study but failed to follow directions and were therefore excluded from all analyses. Participants were approached on the University of British Columbia-Vancouver campus during the morning hours and randomly assigned to receive \$5 or \$20, and to spend this money on themselves or someone else.

### *Materials and Procedure.*

Just before receiving their money, participants were asked to complete the Positive and Negative Affect Schedule (PANAS; *SI6*), as well as reporting their happiness on the same single-item measure used in the previous studies. That evening, after spending their windfall, participants again completed the PANAS and a modified version of the single-item happiness measure (specifically, participants were asked to rate their overall happiness that day on a 5-point scale anchored with the words “not happy at all” to “extremely happy”). We standardized the 10 positive affect items of the PANAS and the single-item happiness measure to create reliable 11-item indices of happiness both pre-windfall ( $\alpha = .81$ ) and post-windfall ( $\alpha = .87$ ). A preliminary ANOVA on pre-windfall happiness revealed no between-group differences, [ $F$ 's  $< 1$ ], enabling the use of ANCOVA (with pre-windfall happiness as a covariate) in the main analyses of post-windfall happiness. We also tested for the possibility that our covariate might interact with our manipulations; we centered our predictor variables (Time 1 happiness, windfall size, and spending direction), and tested for the two-way interactions of these variables, as well as their main effects. This analysis revealed that Time 1 happiness did not moderate the effects of our manipulations,  $t$ 's  $< 1$ , and including these additional interaction terms left the critical main effect of prosocial spending largely unchanged ( $P = .053$ ). Thus, including Time 1 happiness as a covariate in the main analysis was appropriate.

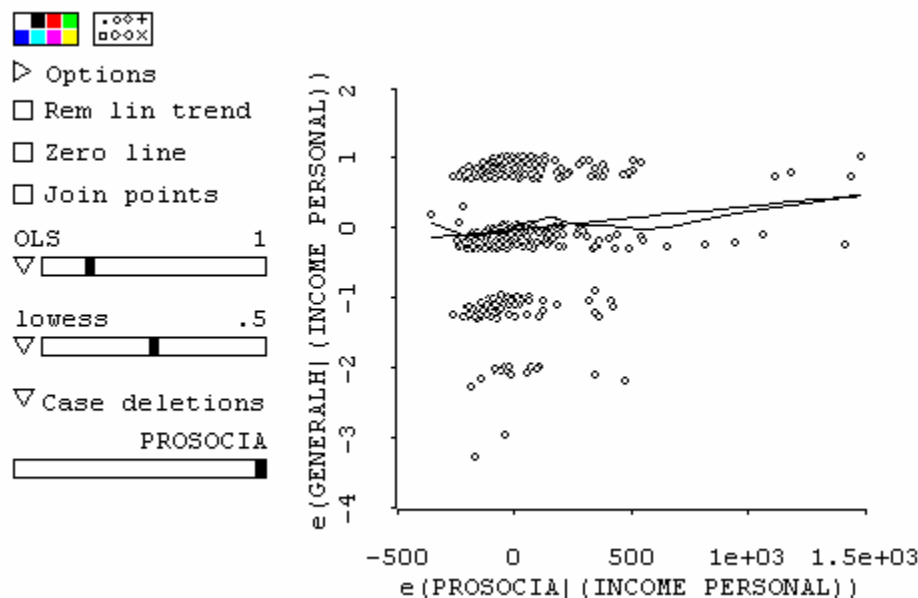
Following completion of the post-windfall happiness questions, participants rated the extent to which they had followed their assigned spending guideline on a scale with response options *not at all* (1), *a little bit* (2), *somewhat* (3), *mostly* (4), and *completely* (5). As noted above, we eliminated three participants (including 2 participants in the personal spending condition and one participant in the prosocial spending condition) who selected “*not at all*” in response to this question, leaving a final sample with a high level of compliance ( $M = 4.41$ ,  $SD = .93$ ).

Participants also completed an open-ended question asking them to report how they had spent their money. In the personal spending condition, typical purchases included magazines, school supplies and meals eaten alone, whereas typical purchases in the prosocial condition included toys for siblings, donations to the homeless and meals eaten with friends. As an additional manipulation check, we asked seven undergraduate coders, who were blind to participants' condition assignment, to rate on a continuous 5-point scale the extent to which participants' spending choices represented a gift/bill/expense for the self (1) versus a gift for someone else/charitable donation (5). Coders exhibited extremely high consensus ( $\alpha = .98$ ), and a t-test revealed that participants in the prosocial condition received higher scores ( $M = 4.70$ ,  $SD = .37$ ) than those in the personal spending condition ( $M = 1.86$ ,  $SD = .96$ ),  $t(43) = 13.16$ ,  $P < .001$ .

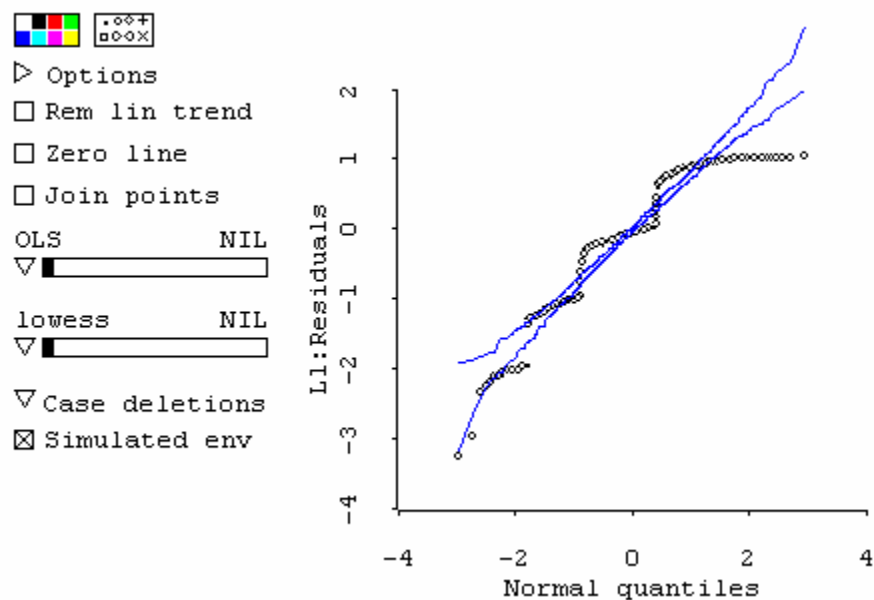
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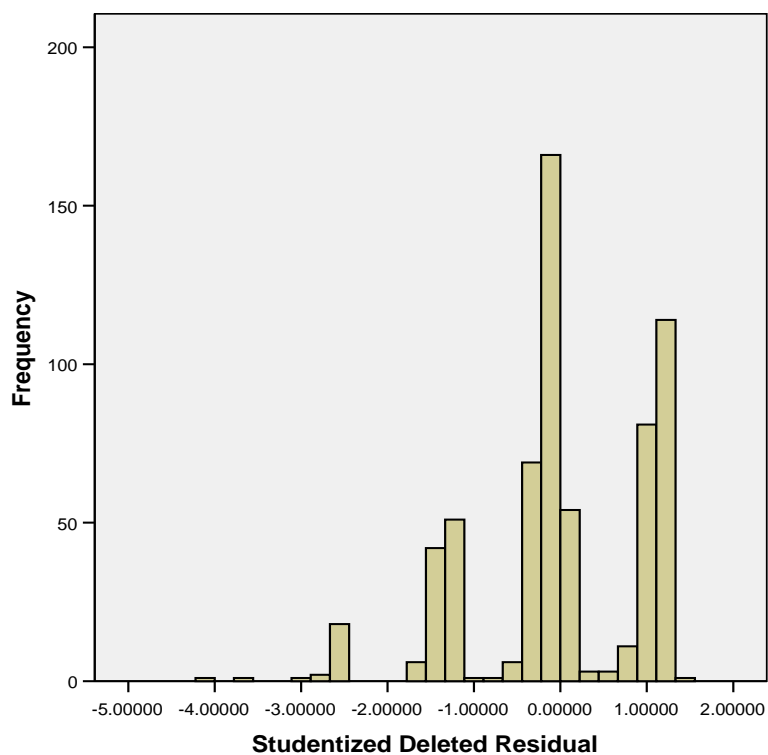
**Figure S1.** Loess regression indicating linear relationship between prosocial spending (x-axis) and happiness (y-axis), controlling for personal spending and income (correlational study).



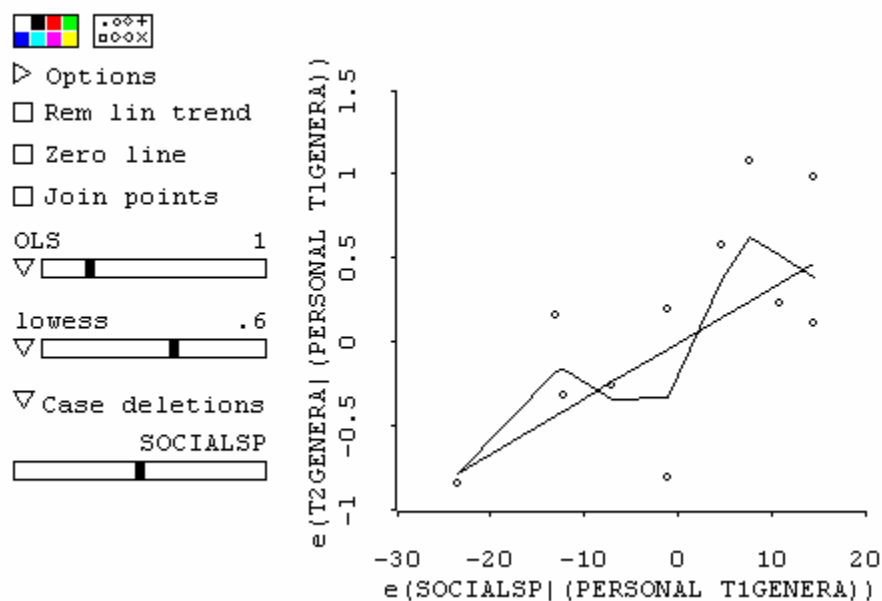
**Figure S2.** Q-Q plot showing minor violation of normality of errors, with envelope representing 95% confidence intervals (correlational study).



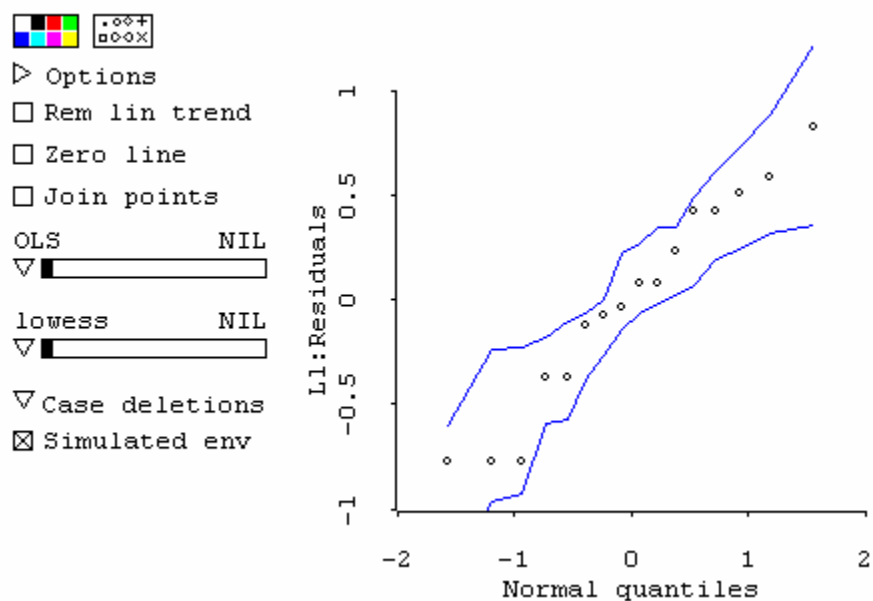
**Figure S3.** Histogram of Studentized Deleted Residuals (correlational study; N = 632).



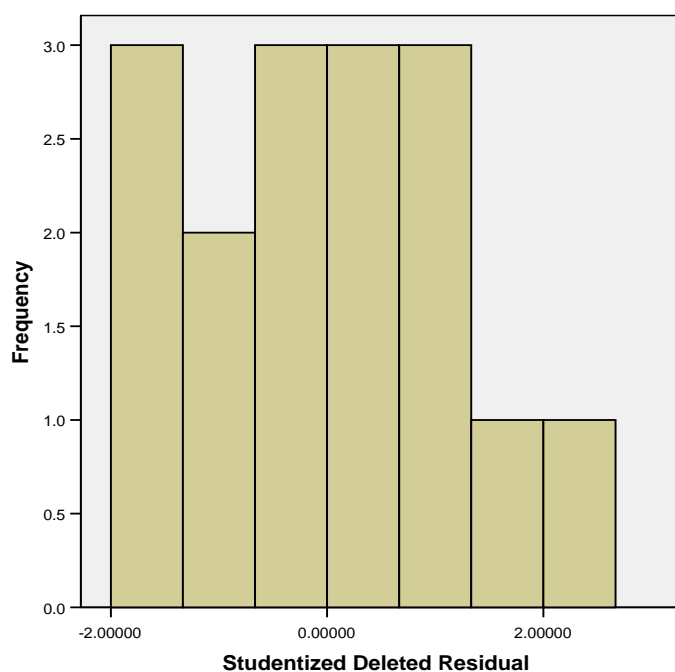
**Figure S4.** Loess regression indicating potential curvilinear relationship between prosocial spending (x-axis) and Time 2 happiness (y-axis), controlling for personal spending and Time 1 happiness (longitudinal study).



**Figure S5.** Q-Q plot showing assumption of normality of errors met, with envelope representing 95% confidence intervals (longitudinal study).





**Figure S6. Histogram of Studentized Deleted Residuals (longitudinal study; N = 16).****Table S1. Correlation matrix (correlational study).**

	General Happiness	Prosocial Spending	Personal Spending	Income
General Happiness	1	.11**	.03	.12**
Prosocial Spending	.11**	1	.44**	.21**
Personal Spending	.03	.44**	1	.25**
Income	.12**	.21**	.25**	1

\*\*  $p < .01$

**Table S2.** Correlation matrix (longitudinal study).

	Time 1 Happiness	Time 2 Happiness	Prosocial Spending	Personal Spending	Income	Bonus Amount
Time 1 Happiness	1	.29	.67**	-.48	.38	.18
Time 2 Happiness	.29	1	.70**	-.55*	.40	.03
Prosocial Spending	.67**	.70**	1	-.68**	.48	.09
Personal Spending	-.48	-.55**	-.68**	1	-.51	-.09
Income	.38	.40	.48	-.51	1	.13
Bonus Amount	.18	.03	.09	-.09	.13	1

\*  $p < .05$  \*\*  $p < .01$