

## Study Information

**Title:** Does Grateful Love Take Two? New insights into Partner Match on Gratitude Using Seven Longitudinal Datasets

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## Research Questions

The main aim of this project is to replicate and extend the findings from McNulty and Dugas (2019) using seven different longitudinal samples with participants of varying relationship lengths. This project will proceed in two preregistered steps. This preregistration is Part 1 in which we focus on replicating the previous effects by taking the same analytic approach as in McNulty and Dugas (2019); Part 2 of this project will involve using Response Surface Analysis to extend Part 1 and will appear as a separate preregistration in the same project folder in OSF. All seven samples we use differ meaningfully from the sample and methods used by McNulty and Dugas, thus our analyses described here will be conceptual replications. Below we list the main research questions we are trying to replicate from McNulty and Dugas (2019).

**Research Question 1.** Does partner gratitude moderate the association between actor gratitude and actor relationship satisfaction at baseline? This question addresses McNulty and Dugas' (2019) finding among a sample of newlywed couples that one's own level of gratitude was associated with higher levels of initial marital satisfaction when a partner was high in gratitude, but not if one's partner was low in gratitude.

**Statistical test of research question 1:** We will run dyadic analyses using the Actor-Partner Interdependence Model (APIM) to test interactive effects of own and partner gratitude on one's own initial level of satisfaction. Analyses will be run in R using the lme4 package and syntax has been uploaded on OSF. All our analyses will be based on raw data pooled from the seven independent samples (i.e., Integrative data analysis; Curran & Hussong, 2009). See the Analysis section for more details.

**Research Question 2.** Does baseline partner gratitude moderate the association between actor gratitude at baseline and actor relationship satisfaction in the future (ranging from 3 months to 12 months)? This question addresses McNulty and Dugas' finding that one's own level of gratitude was associated with higher levels of marital satisfaction three years later when a partner was high in gratitude, but not if the partner was low in gratitude.

**Statistical test of research question 2-1.** We will run similar dyadic models as for research question 1 to test interactive effects of own and partner gratitude on one's future satisfaction (with follow-up length varying between datasets), controlling for the individual's baseline satisfaction.

**Research Questions 3-4.** Extending research questions 1 and 2, we will examine if partner gratitude moderates the association between actor gratitude and actor initial and future levels of *commitment*.

**Statistical test of research questions 3-4.** We will run identical dyadic models as before, replacing satisfaction with commitment. We will test interactive effects of actor and partner gratitude on one's baseline commitment (Research Question 3) as well as on one's future commitment, controlling for the individual's baseline commitment (Research Question 4).

**Research Question 5.** Does actors' baseline gratitude predict partner's gratitude at follow up, controlling for partner's initial levels of gratitude? This question addresses McNulty and Dugas' finding that one's initial levels of gratitude did not predict the partner's gratitude in the future (controlling for the partner's initial levels of gratitude).

**Statistical test of research question 5.** We will run a dyadic model examining the link between one's own gratitude at baseline and partner's gratitude at follow-up gratitude, controlling for the partner's initial levels of gratitude.

## Data description

**Name or brief description of data set(s):** We will use seven existing datasets, six of which have been described in detail on Love Consortium Dataverse.

- 1) Berkeley Couples Study; <https://doi.org/10.15139/S3/BSZEPP>,
- 2) Self-Expansion Study; <https://doi.org/10.15139/S3/FVXARB>,
- 3) Sex and Touch study; <https://doi.org/10.15139/S3/TAI2FI>,
- 4) Sexual Decision Making Study; <https://doi.org/10.15139/S3/LTFCTH>,
- 5) Toronto Couples Study; <https://doi.org/10.15139/S3/K03YHD>,
- 6) SIR Lab Interaction Study; <https://doi.org/10.15139/S3/H3XGFB>,
- 7) Sleep and Relationships Study

**Is this data open or publicly available?** No, but six of the datasets have been uploaded in Love Consortium Dataverse and can be accessed by contacting the authors of each dataset.

**How can the data be accessed? Provide link if available online:** Six of the datasets can be accessed by requesting access from the authors of the datasets through the Love Consortium Dataverse. The seventh dataset was recently collected by one of the co-authors (Amie M. Gordon).

**Date of download or access:** Each of the four authors of this project has access to different datasets, but none of the authors has access to all the datasets.

**Data Source:** Own lab collection – data were collected independently in three different labs (Amie Gordon, Amy Muise, and Emily Impett's labs)

**Codebook:** There is no publicly accessible codebook for the datasets.

### Sampling and data collection procedures:

- 1) Berkeley Couples Study – Eighty romantic couples ( $N = 160$ ) from the San Francisco Bay Area (including UC Berkeley students) enrolled in a study with: (1) baseline survey measures, (2) lab interactions (sacrifice, suffering, and love), (3) a 14-day daily experience study and (4) a three-month longitudinal follow-up survey. To be eligible, they must have been at least 18 years old and in a romantic relationship for a minimum of 6 months. On average, participants were in their mid 20s (range 18-60), had been involved in their romantic relationship for a medium length of 15 months, 53% were European or European American, and 75 out of the 80s couples were heterosexual. Participants independently completed a 45-minute online questionnaire in the days prior to their first lab session. The couple attended the lab session together. There, the participants participated in a series of structured video-recorded conversations, and privately answered brief questionnaires after each conversation. For the subsequent two weeks (14 nights), couple-members independently completed a brief nightly

questionnaire about their day. Three months after the completion of the diary part of the study, both partners separately completed a longitudinal follow-up survey.

- 2) **Self-Expansion Study** – A total of 118 mixed-sex couples were recruited through advertisements on the website Craigslist in 12 major U.S. cities. Interested participants emailed the researchers and if they met the inclusion criteria—in a relationship, living together, both partners interested in participating and aged 18 or older—they were sent the link and information for completing the background and daily surveys online. Participants ranged in age from 19 to 74 ( $M = 31.5$ ,  $SD = 10.4$ ) and had been in their current relationship from 4 months to 30 years ( $M = 4.9$  years,  $SD = 5.3$  years). All the couples were living together; 37% were married and 19% were engaged. About a third of the couples had children (31%), and of these, couples had two children on average ( $M = 2.2$ ,  $SD = 1.1$ ). Participants comprised a diverse range of ethnic backgrounds; 55% were White/European, 14% were African American, 8% were Asian, 5% were Latino, 3% were Native American, 1% were Indian, and 14% self-identified as “other.” Once couples agreed to participate, each partner was e-mailed a unique link. On the first day of the study, each partner completed a 30-minute background survey and then for the next 21 consecutive days, they completed a brief survey (5-10 minutes) each night before bed. The day after completing the final daily survey, participants completed a 10-minute follow-up survey. Participants completed a second follow-up approximately three months later. Participants were instructed to begin the study on the same day as their partner and not to discuss their responses with one another. Each partner was paid up to US\$50 for participating; payment was pro-rated depending on the number of daily surveys completed.
- 3) **Sex and Touch Study** – Ninety-eight couples were recruited from Canada via online ads (posted on Kijiji). Couples were eligible to participate if they were together in a relationship for at least 2 years, were living together and each partner was at least 18 years old (couples were pre-screened for eligibility via email and telephone). Participants’ age ranged from 21 to 61 ( $M = 33$  years,  $SD = 8$  years) and had been in the relationship between 2 to 25 years ( $M = 8$  years,  $SD = 5$  years). Couple members each completed a background survey. Then, each couple member started the 28-day diary study on the same day. Each couple member had to complete 28 daily diaries each evening in total. On average, participants completed 24.7 out of 28 days. Follow-up survey was conducted 3-months later.
- 4) **Sexual Decision Making Study** - Participants were recruited through online postings and classroom visits at a small Canadian university and through online postings on the websites Kijiji and Craigslist in the Greater Toronto Area. To be eligible to participate, both members of the couple had to agree to take part in the study and be over the age of 18. Eligible couples also had to see their partner several times a week and be sexually active. Interested participants who met the eligibility criteria emailed the researchers for more information about the study. After couples agreed to participate, each partner was e-mailed a unique link allowing them to access the online surveys. A

total of 101 couples (95 mixed-sex, 6 same-sex) ranging in age from 18 to 53 years ( $M = 26$  years,  $SD = 7$  years) participated in the study. Nearly half the participants were cohabiting (29%), married (17%), or engaged (3%); the remaining participants were in a committed relationship, but not living together. Participants reported being involved their current relationship between 6 months and 22 years ( $M = 4.45$  years,  $SD = 3.76$  years) and identified as a diverse variety of ethnic backgrounds; 67% were White, 8% were Asian, 7% were Black, 4% were South Asian, 4% were Latin American, 4% were South East Asian, 1% were Arab/West Asian, and 5% identified as multiethnic or “other.” On the first day of the study, participants completed a 30-min background survey. Then, each day for 21 consecutive days, participants completed a 5- to 10-min daily survey. Each participant was paid up to \$40 CAD (in gift cards) for completing the background and daily surveys. Participants also completed a 3 month follow-up survey.

- 5) Toronto Couples Study - This dataset was collected at the University of Toronto between 2015-2017. Romantic couples from the community participated in a four-part study. To be eligible, couples were required to be in a relationship for at least 3 years. A total of 111 couples completed the study. The four parts of the study included (1) completing a background questionnaire; (2) participating in a lab session in which they were connected to physiological equipment and held three conversations, alternating as speakers and listeners, on the topics of (a) a time when they felt distressed, (b) something they would like their partner to change and (c) something about their partner they feel grateful for; and completed questionnaires about these conversations; (3) completing a 14-day daily experience (“diary”) study; and (4) completing a follow-up questionnaire the day after the diary. In addition, a subset of these participants was rated by their work supervisors.
- 6) SIR Lab Interaction Study – Collected between 2010 and 2012, seventy-two couples from the San Francisco Bay Area (20% community participants and 80% UC Berkeley students) participated in a laboratory study with (a) baseline survey measures, (2) lab interactions, and (3) a 6-month longitudinal follow-up survey (74 participants from 53 couples completed the follow up questionnaires). To be eligible, they must have been at least 18 years old, fluent in English, and in their relationship for at least 2 months. On average, participants were 22 years old (range 18-56), had been involved in their romantic relationship for an average length of 21 months (range 1-87), 43% were Asian/Asian American or Pacific Islander, 36% were European or European American, and 9% were Hispanic (13% other race/ethnicities). 71 out of the 72 couples were heterosexual. Participants independently completed an online questionnaire in the days prior to their lab session. The couple attended the lab session together. There, the participants participated in a series of structured video-recorded conversations, and privately answered brief questionnaires at the beginning of the lab session and again after each conversation. Six months after the completion of the lab study, both partners separately completed a longitudinal follow-up survey with questions about their relationships.

- 7) Sleep and Relationships Study; Collected between 2016 and 2018, eighty cohabitating couples (64 heterosexual, 16 homosexual or other) from the San Francisco Bay Area participated in a daily experience study with a 6 month follow up (109 Ps from 67 couples completed the follow up, 4 couples broke up). Participants were eligible if they were between the ages of 20 and 70 ( $M_{age} = 31.62$ , Range = 23 - 62), had been in their relationship for at least 1 year ( $M_{length} = 5.26$ , Range = 1 year to 36 years) and were fluent in English. They were also required to meet a number of health-related eligibility criteria (e.g., not having a sleep disorder). One couple was excluded from data analysis due to lack of compliance with study procedures. Of the remaining 79 couples, 38.7% were married and 8.4% were engaged. The ethnic breakdown was: 14.7% Asian, 64.9% European/European American, 9.9% Hispanic, 3.7% African/African American, and 6.8% Other Ethnicity. Participants ranged in their household income (18.4% < 35K, 22% 35K-75K, 19.4% 75K-100K, 30.9% 100K-200K, 9.5% > 200K) and education (2.6% high school diploma, 11.5% some college, 50.3% college degree, 11% some graduate work, 24.1% graduate degree).

## Knowledge of data

**Prior work based on the dataset:** Following papers used at least one of the key variables that will be used in the current project:

### 1. Berkeley Couples Study

- DeBrot, A., Meuwly, N., Muise, A., Impett, E. A., & Schoebi, D. (2017). More than just sex: Affection accounts for the association between sex and well-being. *Personality and Social Psychology Bulletin*, 43, 1-13.
- Gordon, A., Impett, E. A., Kogan, A., Oveis, C., & Keltner, D. (2012). To have and to hold: Gratitude promotes relationship maintenance in intimate bonds. *Journal of Personality and Social Psychology*, 103, 257-274.
- Impett, E. A., Gere, J., Kogan, A., Gordon, A. M., & Keltner, D. (2014). How sacrifice impacts the giver and the recipient: Insights from approach-avoidance motivational theory. *Journal of Personality*, 82, 390-401.
- Impett, E. A., Gordon, A. M., Kogan, A., Oveis, C., Gable, S. L., & Keltner, D. (2010). Moving toward more perfect unions: daily and long-term consequences of approach and avoidance goals in romantic relationships. *Journal of Personality and Social Psychology*, 99, 948-963.
- Impett, E. A., Kogan, A., English, T., John, O., Oveis, C., Gordon, A. M., & Keltner, D. (2012). Suppression sours sacrifice: Emotional and relational costs of suppressing emotions in romantic relationships. *Personality and Social Psychology Bulletin*, 38, 707-720.
- Impett, E. A., Le, B. M., Kogan, A., Oveis, C., & Keltner, D. (2014). When you think your partner is holding back: The costs of perceived partner suppression during relationship sacrifice. *Social Psychological and Personality Science*, 5, 542-549.
- Joel, S., Gordon, A. M., Impett, E. A., MacDonald, G., & Keltner, D. (2013). The things you do for me: Perceptions of a romantic partner's investments promote gratitude and commitment. *Personality and Social Psychology Bulletin*, 39, 1333-1345.
- Kogan, A., Impett, E. A., Oveis, C., Hui, B., Gordon, A. M., & Keltner, D. (2010). When giving feels good: The intrinsic benefits of sacrifice in romantic relationships for the communally motivated. *Psychological Science*, 21, 1918-1924.
- Park, Y., Impett, E. A., MacDonald, G., & Lemay, E. P. (2019). Saying "thank you": Partners' expressions of gratitude protect relationship satisfaction and commitment from the harmful effects of attachment insecurity. *Journal of Personality and Social Psychology*, 117, 773-806.
- Tan, J. J., Kraus, M. W., Impett, E. A., & Keltner, D. (2018). Partner commitment in close relationships mitigates social class differences in subjective well-being. *Social Psychological and Personality Science*. Advance online publication.
- Visserman, M. L., Impett, E. A., Righetti, F., Muise, A., Keltner, D., & Van Lange, P. A. (2019). To "see" is to feel grateful? A quasi-signal detection analysis of romantic partners' sacrifices. *Social Psychological and Personality Science*, 10, 317-325.

## 2. Self-Expansion Study

- Brady, A., Baker, L. R., Muise, A. & Impett, E. A. (2020). Gratitude increases the motivation to fulfill a partner's sexual needs. *Social Psychological and Personality Science*. Advanced online publication.
- Muise, A., Harasymchuk, C., Day, L. C., Bacev-Giles, C., Gere, J., & Impett, E. A. (2019). Broadening your horizons: Self-expanding activities promote desire and satisfaction in established romantic relationships. *Journal of Personality and Social Psychology*, 116, 237-258.
- Muise, A., & Impett, E. A. (2015). Good, giving, and game: The relationship benefits of communal sexual motivation. *Social Psychological and Personality Science*, 6, 164-172.

## 3. Sex and Touch Study

- Kim, J. J., Muise, A., & Impett, E. A. (2018). The relationship implications of rejecting a partner for sex kindly versus having sex reluctantly. *Journal of Social and Personal Relationships*, 35, 485–508.
- Kim, J. J., Muise, A., Sakaluk, J. K., Rosen, N. O., & Impett, E. A. (2020) When tonight is not the night: Sexual rejection behaviors and satisfaction in romantic relationships. *Personality and Social Psychology Bulletin*. Advance online publication.

## 4 Sexual Decision Making Study

- Day, L. C., Muise, A., Joel, S., & Impett, E. A. (2015). To do it or not to do it? How communally motivated people navigate sexual interdependence dilemmas. *Personality and Social Psychology Bulletin*, 41, 791-804.
- Muise, A., Giang, E., & Impett, E. A. (2014). Post sex affectionate exchanges promote sexual and relationship satisfaction. *Archives of Sexual Behavior*, 43, 1391-1402.
- Muise, A., Stanton, S. C., Kim, J. J., & Impett, E. A. (2016). Not in the mood? Men under-(not over-) perceive their partner's sexual desire in established intimate relationships. *Journal of Personality and Social Psychology*, 110, 725-742.

## 5. SIR Lab Interaction Study

- Gordon, A. M., Tuskeviciute, R., & Chen, S. (2013). A multi-method investigation of depressive symptoms, perceived understanding, and relationship quality. *Personal Relationships*, 20, 635-654.

**Prior Research Activity:** Authors have different experiences with the datasets; Yoobin Park, who will be conducting the analyses, has used two of the datasets, including at least one of the key variables that will be used for this project. However, none of the previous analyses conducted were relevant to the current hypotheses.

**Prior Knowledge current dataset:** Authors have different prior knowledge on each of the seven datasets; Yoobin Park has some first-hand knowledge about two of the datasets but has not seen full data or descriptive statistics of the key variables in other datasets.



**Moment of preregistration:** Registration occurred prior to any researcher on the team having access to all datasets or testing the proposed hypotheses in any datasets.

## Current study: Variables

**Manipulated variables:** Not Applicable

**Measured variables:**

### Key variables:

Gratitude was measured using Appreciation in Relationships scale (AIR; Gordon, Impett, Kogan, Oveis, & Keltner, 2012) which includes two subscales (“Appreciative” and “Appreciated”) and has 16 items rated on a 7-point scale.

Satisfaction was measured using 5 items from the Investment Model Scale (Rusbult, Martz, & Agnew, 1998) that were assessed on a 7-point scale in four datasets. In three datasets, the 4-item Couples Satisfaction Index (Funk & Rogge, 2007) was used and the items were assessed on a 6-point scale. Commitment was measured using 7 items from the Investment Model Scale that were assessed on a 7-point scale in all datasets.

Demographic variables: gender, age, and relationship length (in years)

### **Scales:**

- **Gratitude.** We will use a mean score of 9 items of the “Appreciative” subscale of the AIR scale (Gordon et al., 2012):
  1. I tell my partner often that s/he is the best.
  2. I often tell my partner how much I appreciate her/him.
  3. at times I take my partner for granted.
  4. I appreciate my partner.
  5. sometimes I don't really acknowledge or treat my partner like s/he is someone special.
  6. I make sure my partner feels appreciated.
  7. my partner sometimes says that I fail to notice the nice things that s/he does for me.
  8. I acknowledge the things that my partner does for me, Even the really small things.
  9. I am sometimes struck with a sense of awe and wonder when I think about my partner being in my life.
- **Satisfaction.** The seven datasets had either of the following two scales to measure satisfaction:
  - a) 5 items from the “Satisfaction” subscale of the Investment Model Scale:
    1. I feel satisfied with our relationship.
    2. My relationship is much better than others' relationships.
    3. My relationship is close to ideal.
    4. Our relationship makes me very happy.
    5. Our relationship does a good job of fulfilling my needs for intimacy

b) 4 items from the Couple Satisfaction Index:

1. Please indicate the degree of happiness, all things considered, of your relationship.
2. I have a warm and comfortable relationship with my partner.
3. How rewarding is your relationship with your partner?
4. In general, how satisfied are you with your relationship?

We will first create a commensurate measure of satisfaction following the moderated nonlinear factor analysis (MNLFA) scoring approach (Bauer, 2017). We will use an R package, aMNLFA (Gottfredson et al., 2020), to build a scoring model that accounts for effects of differential item functioning (DIF) and mean and variance impact. We will use the final factor score estimates of satisfaction for the subsequent analyses.

- **Commitment.** We will use a mean score of 7 items of the “Commitment” subscale of the Investment Model Scale:
  1. I want our relationship to last for a very long time.
  2. I am committed to maintaining my relationship with my partner.
  3. I would not feel very upset if our relationship were to end in the near future.
  4. It is likely that I will date someone other than my partner within the next year.
  5. I feel very attached to our relationship.
  6. I want our relationship to last forever.
  7. I am oriented toward the long-term future of my relationship (for example, I imagine being with my partner several years from now).

**Indices:** Not Applicable

**Transformations:** Actor and partner gratitude will be grand mean centered prior to analyses.

**Data inclusion/exclusion:** We will use the samples in full.

**Outliers:** We will examine if there are any influential observations that, when deleted, can affect the conclusions of our analyses. We will assess changes in the estimation of the variance components using relative variance change and changes in fixed effects using Cook’s distance. HLMdiag package in R will be used for the analyses. As suggested by West, Ryu, Kwok and Cham (2011), we will run the analyses with and without deleting the outlier(s) and report both results.

**Weights:** Not Applicable

**Sample size:** Sample size varies from 72 to 118 couples in the seven datasets.

**Missing data:** If the participant or the partner did not complete any of the three key variables, the couple will not be included in the analysis.

## Current study: Analyses

As preliminary analyses, we will examine the demographic composition of the sample and descriptive statistics (mean and standard deviations) of the key variables (gratitude, satisfaction, and commitment). We will also examine and report all correlations among these variables as well as intercorrelations between members of the couples.

**Statistical models:** Our analyses will be based on pooled data from the seven datasets. Consistent with the fixed effects IDA approach (Curran & Hussong, 2009), we will include a variable denoting study membership as a predictor in all our fitted models. To test our research questions #1 - #4, we will conduct multilevel model analyses, with participants nested within dyads. Intercepts will be specified as random and slopes will be specified as fixed. We will use restricted maximum likelihood estimation. All analyses will be conducted using the lme4 package (Bates, Maechler, Bolker, & Walker, 2014) in R. The package lmerTest (Kuznetsova, Brockhoff, & Christensen, 2016) will be used to approximate degrees of freedom based on the Satterthwaite's method and to calculate p-values. The syntax is uploaded on XXX.

**Statistical test of research question 1:** The predictors in the model will be actor gratitude, partner gratitude, and their interactions; the outcome variable will be actor satisfaction at baseline.

**Statistical test of research question 2:** The predictors in the model will be actor gratitude, partner gratitude, their interactions, and baseline actor marital satisfaction; the outcome variable will be actor satisfaction at the follow-up.

**Statistical test of research question 3:** The predictors in the model will be actor gratitude, partner gratitude, their interactions; the outcome variable will be actor commitment at baseline.

**Statistical test of research question 4:** The predictors in the model will be actor gratitude, partner gratitude, their interactions; the outcome variable will be actor commitment at the follow-up.

**Statistical test of research question 5:** The predictors in the model will be actor and partner gratitude; the outcome variable will be partner gratitude at the follow-up; intercorrelations between couples' gratitude.

**Follow-up analyses:** We will follow up any significant interactions with simple slope tests. Specifically, we will examine the extent to which own gratitude is linked with the outcome variable when partner gratitude is one standard deviation above and below the mean.

**Inference criteria:** We will use the standard two-tailed  $p < .05$  criteria for determining if the interactions and simple slope tests suggest that the results are significantly different from those expected if the null hypothesis were correct.

**Sensitivity analyses:**

We will run all the analyses with gender, age, and relationship length included in the models.

**Exploratory analyses:**

- 1) Following research question #5 (effect of one's own gratitude on the partner's follow-up gratitude), we will examine how the partner's perceptions of the actor's gratitude plays a role by examining an indirect effect via the partner's feelings of being appreciated. That is, we will test if an actor's gratitude is linked with the partner's follow-up feelings of being appreciated (controlling for baseline partner appreciated), and thus the partner's follow-up gratitude (controlling for baseline partner gratitude).
- 2) Following research questions #2, #4, and #5 in which the outcome is a follow-up variable, we will test for potential study difference in our effect of interest. Specifically, the time between the baseline and follow-up survey differed across the datasets; there was one dataset with a 2-week follow-up, three with a 3-month follow-up, and two with a 6-month follow-up. We will create a group variable indicating the three different intervals and test for potential group differences in our effect of interest by including interactions by group and the effect.