

Competitive helping in online giving

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Unconditional generosity in humans is a puzzle. One possibility is that individuals benefit from being seen as generous if there is competition for access to partners and if generosity is a costly - and therefore reliable - signal of partner quality [1-3]. The 'competitive helping' hypothesis predicts that people will compete to be the most generous, particularly in the presence of attractive potential partners [1]. However, this key prediction has not been directly tested. Using data from online fundraising pages, we demonstrate competitive helping in the real world. Donations to fundraising pages are public and made sequentially. Donors can therefore respond to the behavior of previous donors, creating a potential generosity tournament. Our test of the competitive helping hypothesis focuses on the response to large, visible donations. We show that male donors show significantly stronger responses (by donating more) when they are donating to an attractive female fundraiser and responding to a large donation made by another male donor. The responses for this condition are around four times greater than when males give to less attractive female (or male) fundraisers or when they respond to a large donation made by a female donor. Unlike males, females do not compete in donations when giving to attractive male fundraisers. These data suggest that males use competitive helping displays in the presence of attractive females and suggest a role for sexual selection in explaining unconditional generosity.

Results and Discussion

Despite individual incentives to free-ride, humans often cooperate in social dilemmas. In repeated, two-player games, individuals can benefit if the partner reciprocates [4]; while, in larger groups, the possibility that cheating will be punished [5] or that generous actions will be rewarded [6] are possible explanations for cooperation. Most of the evidence for punishment and rewarding, however, comes from laboratory studies, while the prevalence of these strategies in real-world settings has been questioned [5]. A plausible alternative - yet seldom acknowledged- mechanism is so-called competitive helping [2] (also known as 'competitive altruism' [1]). This theory assumes that there is a biological market [2], where individuals compete for access to partners with the highest market value by signalling their value through costly helping displays [1]. Signal reliability is maintained by the cost associated with sending it [3]. Extravagant helping displays might therefore serve as an honest signal of an individual's underlying quality [7], including access to resources or cooperative intent. Although the term 'competitive altruism' is commonly used to describe extravagant generosity (e.g. [1, 8-13]), competitive helping displays are not truly altruistic since the signaller is expected to derive personal benefits from their actions.

Several laboratory studies offer evidence suggestive of competitive helping. People are more generous when they are observed [8-10] and the most helpful individuals are preferentially chosen for subsequent interactions requiring cooperation [11-13]. Costly helping displays could be used to attract sexual partners. Although males tend to prioritise physical cues of fertility when choosing mates [14], females place a higher premium on resource acquisition [14] and have also been shown to be more sensitive to cooperative tendency in sexual partners [15] - both of which may be

advertised via helpful actions. Thus, competitive helping might be particularly pronounced among males (although this does not preclude female-female competition in this or other contexts). Indeed, males are more sensitive than females to the presence of an opposite sex audience when performing helping behavior [9, 16]. While these various studies indicate that people are motivated to acquire a good reputation and that individuals might be preferred as partners on this basis, the acid test of competitive helping requires evidence that people compete directly, by increasing generosity in response to displays from competitors [1, 13]. To our knowledge, no study has provided evidence of responsive competitive helping. We do this here.

We use data from a large, UK-based, online fundraising platform to test a key prediction of the competitive helping hypothesis: that males respond competitively to the generosity bids of other males in the presence of attractive females. Online fundraising platforms provide a unique forum to test this idea in a real world setting. Fundraisers host fundraising pages where they provide personal information (name, photo, charity and event they are being sponsored for) and collect donations, nearly all from donors personally known to them. Donations to fundraising pages are made sequentially and the names and contributions of all donors to a fundraiser's page are visible in chronological order (unless donors opt for anonymity), so that new donors can see who has donated before them and how much [17]. This creates a potential tournament in which donors may compete by responding to how much others have given. Previous work has shown that existing donations on a page act as an anchor for current donors, indicating that donors do pay attention to other donors' actions in this setting [17]. Here, we ask whether donors' behavior was affected by the gender and attractiveness of the fundraiser and whether they competed with other donors of the same gender.

For our analysis sample of 2,561 fundraising pages, the mean (\pm sem) number of donations per page was 42.8 (\pm 0.71), averaging £30.3 (\pm 0.22) per donor. The average total amount raised per page was £1,300.50 (\pm 28.4) (see Table S1 for all descriptive statistics). Regardless of their gender, more

attractive fundraisers raised more money than less attractive fundraisers: a one-standard deviation increase in attractiveness was associated with an average £182.3 (\pm 54.0) increase in total amount raised by fundraisers, controlling for their age (linear regression: $F_{1, 2544} = 11.4$; $P = 0.001$; Table S2). Attractive fundraisers of both sexes received more donations (linear regression: $F_{1, 2544} = 8.41$; $P = 0.004$; Table S2) and, to a lesser extent, also received larger donations (linear regression: $F_{1, 2544} = 2.78$; $P = 0.10$; Table S2). For female fundraisers, attractiveness was significantly correlated with maximum donation size (linear regression: $F_{1, 2543} = 9.08$; $P = 0.003$; Table S2), which increased by £41.1 (\pm 13.6) with a one-standard deviation increase in attractiveness.

Our test for competitive helping focused on donors' responses to "large", visible donations on a fundraising page ("large" was defined as at least twice the previous page mean and more than £50, *sensu* [17]). Responses to large donations were measured by calculating the difference in amount given after the large donation (£) relative to the mean donation size for that page prior to the large donation (hereafter the 'PRE-mean'). The PRE-mean was calculated using up to 10 (where available, *sensu* [17]) donations made prior to the large donation. Note that we only used donations made by donors of the same gender – so the male response is calculated relative to the PRE-mean defined for male donors. For each fundraising page, we considered the responses of up to 15 donors (where available) following the large donation, yielding a sample size of 1,800 for male donor responses and 1,295 for female donor responses. 'Fundraising page ID' was included as a random term in each model to control for the effects of repeated observations for the same fundraiser and fundraising page on the distribution of the data.

Arriving on a fundraising page after large donations has been shown to have a positive effect on the size of donations with no effect on the quantity of donations [17]. In our sample, 1,829 pages had large donations (mean large donation size: £115.20 \pm 2.69). Of these, 420 were made by males and 248 by females, with the remainder not gender-assignable. We focus our analysis on the 668 large

donations for which we could assign a gender. Summary statistics are given in Table S1. The size of a large donation did not significantly differ by either donor or fundraiser gender (tests for equality of means, all $P > 0.05$; see supplemental information). Results from a linear mixed model (LMM) with maximum likelihood shows that, in line with previous results [17], a large donation had a positive effect on subsequent amounts, increasing donations by £9.55 (± 1.27).

Under the competitive helping hypothesis, we expected a significantly stronger response by donors when (i) the fundraiser was an attractive member of the opposite sex (where “attractive” was defined as being within the top quartile); and (ii) the large donation was made by someone of the same sex. We contrasted the responses by donors in this “competitive helping” condition to their responses in all other cases. Results are summarized in Figure 1. For males, we found that a large donation was associated with an additional response of £28.35 (± 7.75) in the competitive helping case, over and above the average response in all other cases, which was £9.61 (± 1.61). This additional response by male donors in the competitive helping condition was significantly different to that in all other case ($\chi^2_{1, 1800} = 13.38$; $P < 0.001$). However, when we ran a similar model for female donors, asking whether females would show a greater response when giving to an attractive male fundraiser and when the large donation was made by another female, we found that female donors did not show greater responses in the “competitive helping” case ($\chi^2_{1, 1295} = 0.54$; $P = 0.461$).

We then explored variation in male donor responses in more detail. Using the same response term (change in donation amount, £, relative to the PRE-mean) we ran a LMM with 'fundraising page ID' as the random term and the three-way interaction between three categorical explanatory variables: fundraiser gender (male / female), fundraiser attractiveness (plain / average / attractive), large donor gender (male / female). Thus, the model had a 2 x 3 x 2 design (Table S3) allowing us to check whether male responses would be strongest in the scenario predicted by competitive helping theory

(i.e. when giving to an attractive female fundraiser and when the large donation was made by another male) compared to any of the other 11 possible scenarios. The results are shown in Figure 2 and confirm the expected pattern: male donors responded to a large donation to the greatest extent when giving to a female fundraiser who was attractive and when the large donation came from another male donor. Their response in this case was significantly greater (see Table S4) – and around four times larger – than their response in any of the other 11 cases.

These results support a key prediction of competitive helping theory [1, 2, 13], by showing that male donors compete directly with other males in the presence of an attractive, opposite-sex audience, although we find no evidence for this in females. Whether competitive helping displays produce fitness benefits remains an open avenue for further exploration, although previous work has shown that more cooperative individuals are preferred as sexual partners [15]. We also note that competitive helping responses are not necessarily conscious responses either to the donations of others or to the perceived attractiveness of the fundraiser, but may instead reflect responses of an evolved psychology to maximise the benefits associated with helping in different contexts. Previous work has shown that donors are sensitive to the donations of others and in particular conform to descriptive social norms by giving what they believe is the normative amount [18]. In contrast, here we show that males do not conform to the majority when making donations but instead compete directly with other males when donating to attractive females. Excessively cooperative individuals can be shunned or punished [19] and sometimes opt for anonymity when making large donations [20]. Our findings provide a possible explanation for this, indicating that overt generosity can be a competitive rather than a cooperative act.

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Figure 1. Change in amount given (£, effect size and confidence intervals from a single LMM) among male donors (N = 1800) and female donors (N = 1295) in response to a large donation relative to the PRE-mean. 'Competitive helping scenario' refers to the case where competitive helping would be expected. For males, this is an attractive female fundraiser and a large donation by another male donor. For females, this is an attractive male fundraiser and a large donation by another female donor. 'All other scenarios' are all other cases.

Figure 2. Change in amount given (£, effect size and confidence intervals from a single LMM) among male donors (N = 1800) in response to a large donation relative to the PRE-mean. Responses to a large donation varied with the gender and attractiveness of the fundraiser and whether the large donation was made by (A) a male or (B) female donor. Male donors increased their giving by more when giving to an attractive female fundraiser and responding to a large donation made by a male competitor than in any other case.

Methods

Our initial sample consisted of 4,581 pages for the 2014 Virgin London Marathon for which fundraisers had uploaded one profile photo, allowing us to obtain an attractiveness rating. Of this initial sample, 91 had a URL that did not link to a page, leaving 4,490 pages. For these pages, we sought four independent beauty ratings (on a scale of 0 – 10) of each fundraiser based on their photo (following [21]) by recruiting 1,189 raters (651 males; 520 females; 16 did not specify) from the Amazon Mechanical Turk (MTurk) crowdsourcing platform (www.mturk.com). The mean age of the raters was 31 ± 0.3 (range: 18 - 72). To minimise any confounding effects of inter-cultural differences in attractiveness ratings [22], only US-based workers were asked to provide ratings since the majority of workers on MTurk are based in the US and the US and UK are categorized as belonging to the same world culture [23]. Each rater was expected to look at 20 pages. As well as

rating attractiveness, raters were also asked the gender of the fundraiser, what sort of clothes they were wearing (e.g. sporting / fancy dress), whether they were smiling, the colour of their hair and approximate age. The questions the raters were expected to answer are available as supplemental information. Donor gender was not observed directly but was inferred on the basis of their names, acquired from the fundraising pages. We were able to assign a gender to 46.1 % of the donors in our sample. Cases where we could not include ambiguous names (e.g. Sam, Chris), multiple names (e.g. Sue and David) and anonymous donations.

We judged 2,561 fundraisers to have a valid set of attractiveness ratings where (i) they had at least three non-missing ratings and (ii) all raters agreed on the fundraiser's gender. The main reasons for missing ratings were that the photo was not of a person or was of more than one person, such that the fundraiser could not be identified. We found a high level of agreement among raters over the attractiveness of fundraisers: for our sample of 2,561 fundraisers, Cronbach's alpha was 0.88 (0.63 for male fundraisers and 0.94 for female fundraisers). For our analysis, we created standardized aggregate measures of attractiveness (a_i) for each fundraiser in the following way (following [24]). Each rater rated up to 20 pictures and each fundraiser had three or four ratings. We first transformed the rating by rater j of fundraiser i into a z-score and then took the average of the three / four z-scores for each fundraiser. In line with previous studies (e.g. [14]), gender, hair colour, age and whether the person was smiling were all significantly correlated with attractiveness (see supplemental information). For all further statistical details and tables please refer to the supplemental information.

Supplemental Information is linked to the online version of the paper at :

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