

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.

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Results and Discussion

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Despite individual incentives to free-ride, humans often cooperate in social dilemmas. In repeated,
30 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
32 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
34 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
36 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
38 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
40 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
42 since the signaller is expected to derive personal benefits from their actions.

44 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
46 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
48 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
50 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,
52 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
54 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
56 response to displays from competitors [1, 13]. To our knowledge, no study has provided evidence of
responsive competitive helping. We do this here.

58

We use data from a large, UK-based, online fundraising platform to test a key prediction of the
60 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
62 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,
64 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
66 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
68 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'
70 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.

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For our analysis sample of 2,561 fundraising pages, the mean (\pm sem) number of donations per page
74 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
76 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
78 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 (± 13.6) with a one-standard deviation increase in attractiveness.

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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.

98 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
106 positive effect on subsequent amounts, increasing donations by £9.55 (\pm 1.27)..

108 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
110 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
112 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 (\pm 7.75) in the competitive helping
114 case, over and above the average response in all other cases, which was £9.61 (\pm 1.61). This
additional response by male donors in the competitive helping condition was significantly different
116 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
118 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 ($\chi^2_{1, 1295} = 0.54; P =$
120 0.461).

122 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'
124 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
126 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
128 (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
130 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
132 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.

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These results support a key prediction of competitive helping theory [1, 2, 13], by showing that
136 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
138 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
140 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
142 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
144 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
146 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
148 [20]. Our findings provide a possible explanation for this, indicating that overt generosity can be a
competitive rather than a cooperative act.

150

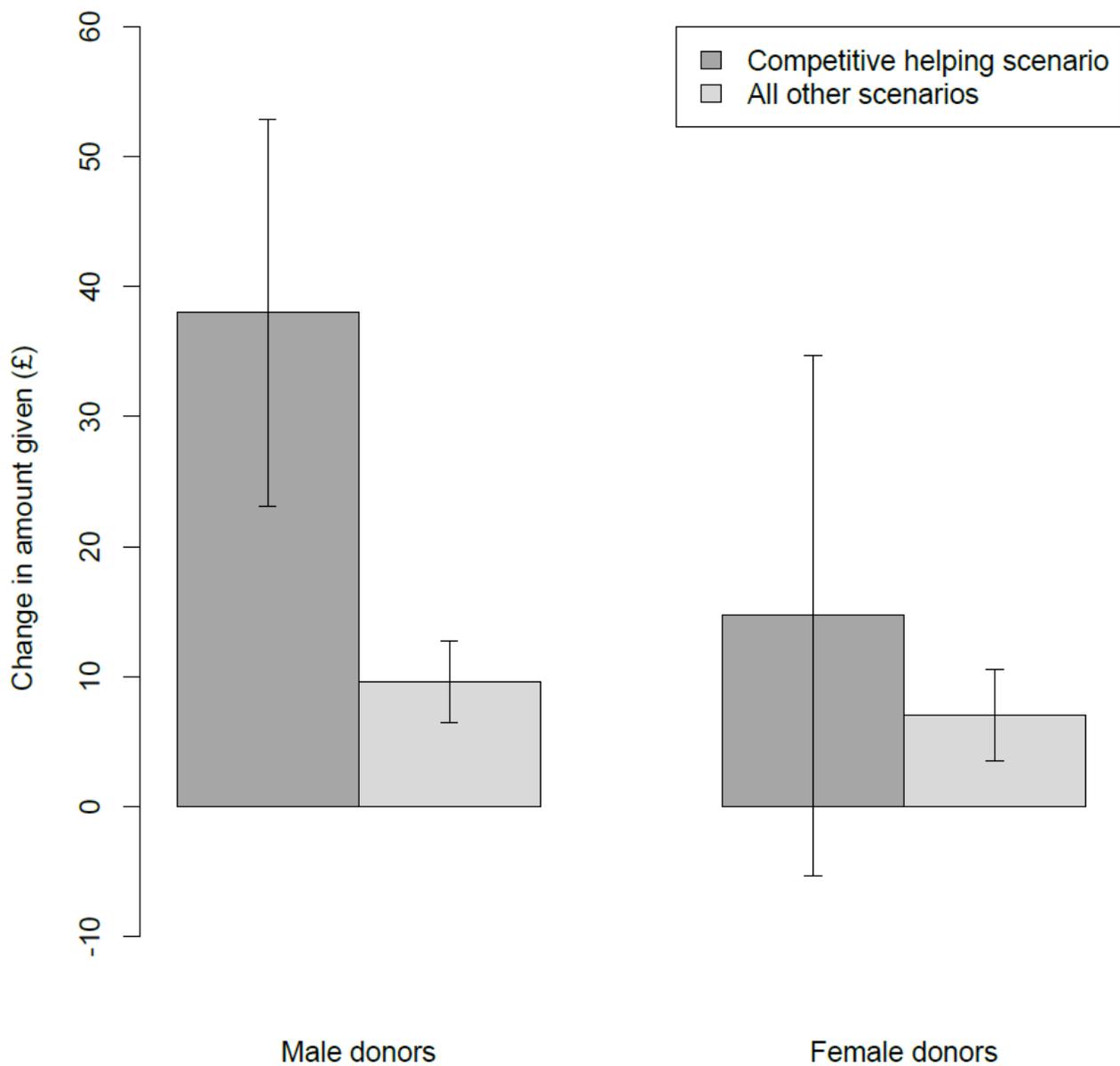
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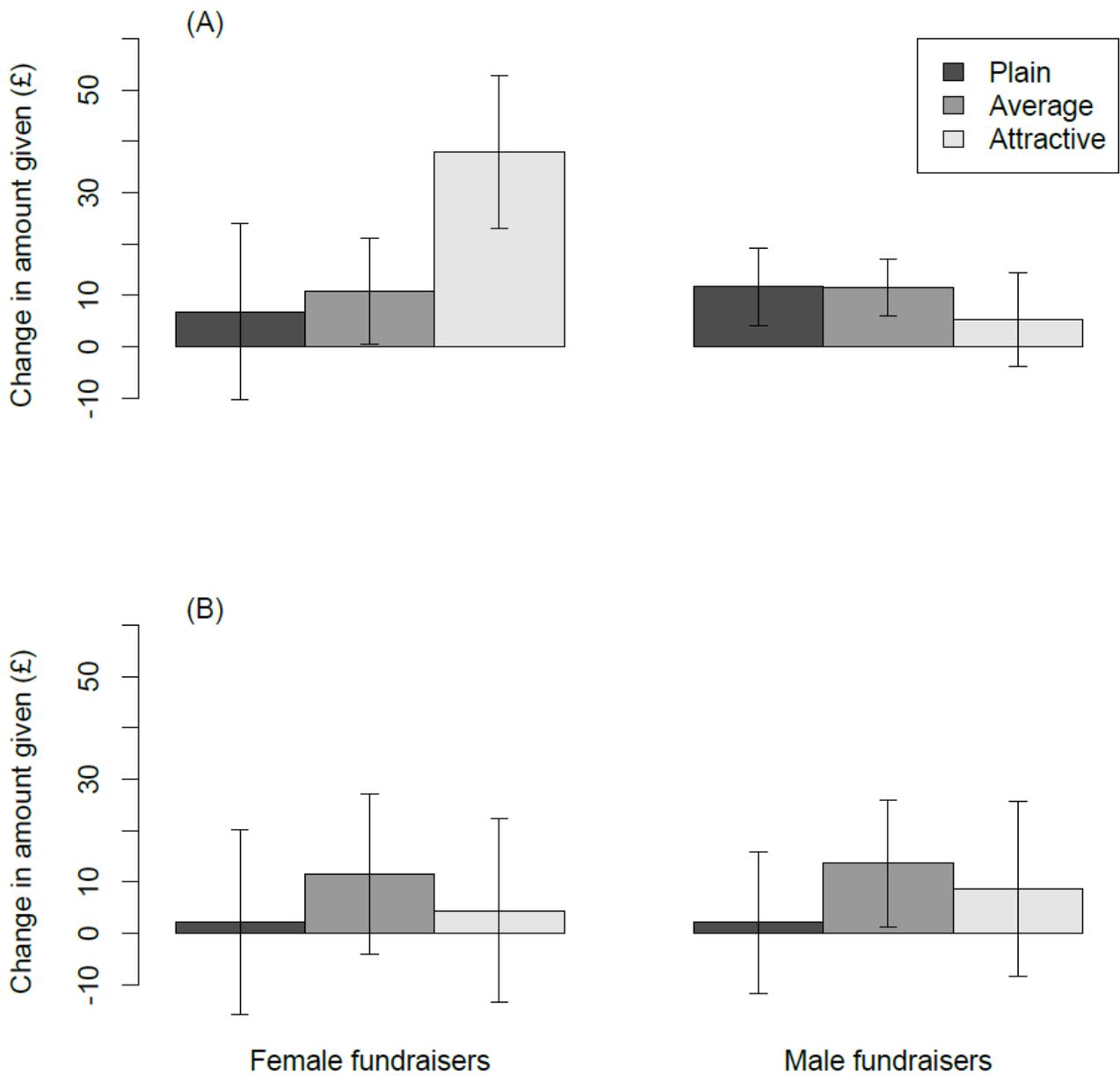
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206 Figure 1. Change in amount given (£, effect size and confidence intervals from a single LMM)
 among male donors (N = 1800) and female donors (N = 1295) in response to a large donation
 208 relative to the PRE-mean. 'Competitive helping scenario' refers to the case where competitive
 helping would be expected. For males, this is an attractive female fundraiser and a large donation by
 210 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.

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

224 **Methods**

Our initial sample consisted of 4,581 pages for the 2014 Virgin London Marathon for which
226 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
228 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
230 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
232 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
234 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
236 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
238 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
240 sample. Cases where we could not include ambiguous names (e.g. Sam, Chris), multiple names (e.g.
Sue and David) and anonymous donations.

242

We judged 2,561 fundraisers to have a valid set of attractiveness ratings where (i) they had at least
244 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
246 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
248 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]).

250 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-
252 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
254 supplemental information). For all further statistical details and tables please refer to the
supplemental information.

256

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

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