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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.

26

30 **Results and Discussion**

32 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
34 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,
36 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
38 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
40 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
42 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
44 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.

46

Several laboratory studies offer evidence suggestive of competitive helping. People are more
48 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
50 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
52 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
54 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
56 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
58 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
60 responsive competitive helping. We do this here.

62 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
64 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
66 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
68 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
70 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
72 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
74 attractiveness of the fundraiser and whether they competed with other donors of the same gender.

76 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
78 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
80 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
82 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: $F_{1, 2544}$
84 $= 2.78$; $P = 0.10$; 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
86 £41.1 (\pm 13.6) with a one-standard deviation increase in attractiveness.

88 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,
90 *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
92 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
94 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
96 (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
98 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.

100

Arriving on a fundraising page after large donations has been shown to have a positive effect on the
102 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
104 248 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
106 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)
108 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).

110

Under the competitive helping hypothesis, we expected a significantly stronger response by donors
112 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
114 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
116 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
118 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
120 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
122 donors did not show greater responses in the “competitive helping” case ($\chi^2_{1, 1295} = 0.54$; $P =$
0.461).

124

We then explored variation in male donor responses in more detail. Using the same response term
126 (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:
128 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
130 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
132 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
134 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
136 around four times larger – than their response in any of the other 11 cases.

138 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
140 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
142 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
144 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
146 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
148 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
150 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
152 competitive rather than a cooperative act.

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208 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
210 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
212 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.

214

Figure 2. Change in amount given (£, effect size and confidence intervals from a single LMM)
216 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
218 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
220 competitor than in any other case.

222 **Methods**

Our initial sample consisted of 4,581 pages for the 2014 Virgin London Marathon for which
224 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
226 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
228 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
230 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
232 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
234 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
236 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
238 sample. Cases where we could not include ambiguous names (e.g. Sam, Chris), multiple names (e.g.
Sue and David) and anonymous donations.

240

We judged 2,561 fundraisers to have a valid set of attractiveness ratings where (i) they had at least
242 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
244 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
246 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]).
248 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-
250 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
252 supplemental information). For all further statistical details and tables please refer to the
supplemental information.

254

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

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258 **Author Contributions** Both authors contributed equally to this study.

