

Collective responsibility amplifies mitigation behaviors

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Received: 15 October 2015 / Accepted: 30 March 2016 / Published online: 4 May 2016
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Abstract How can individuals be convinced to act on climate change? It is widely assumed that emphasizing personal responsibility for climate change is effective at increasing pro-climate behavior whereas collectively framing the causes of climate change diffuses responsibility and dampens the incentive for individual action. We observe the opposite result. Here we find, across three experiments, that emphasizing collective responsibility for the causes of climate change increases pro-climate monetary donations by approximately 7 % in environmental group members and by 50 % in the general public. Further, highlighting collective responsibility amplifies intent to reduce future carbon emissions. In contrast, focusing on personal responsibility for climate change does not significantly alter donations to climate change advocacy or the intent for future pro-climate behavior. These effects replicate and persist multiple days after treatment.

Keywords Climate change responsibility · Prosocial behavior · Climate change mitigation

1 Introduction

Many climate messages appeal directly to the individual's role in emission reductions. For example, a Sierra Club newsletter touts "Five Simple Things You Can Do About Global

Electronic supplementary material The online version of this article (doi:10.1007/s10584-016-1670-9) contains supplementary material, which is available to authorized users.

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Warming This Year.” Subsequent newsletters ask “How Green is your Laundry?”, “How Green is your PC?”, and “How Green is Your Vacation?” (The Sierra Club 2014). This style of messaging, aimed at evoking feelings of personal responsibility, is common in advocacy organizations’ climate outreach. However, eliciting behavioral change is tricky (Brekke and Johansson-Stenman 2008; Gneezy et al. 2011). Along with the practical linking of climate cause, effect, and ameliorative action, personal responsibility messages may produce other, less helpful responses. Guilt, denial, sadness, and cognitive dissonance are all associated with recognizing one’s own role in the climate problem (Doherty and Clayton 2011). While in some situations these factors can be motivating, in others they can be acutely demotivating (Festinger 1957; Tangney et al. 2007; Brekke and Johansson-Stenman 2008; Gifford 2011). Thus, placing emphasis on personal responsibility might encourage behavioral change that protects the environment (Eden 1993; Basil et al. 2006; Wells et al. 2011; Bolsen et al. 2014; Rickard et al. 2014). On the other hand, it could be ineffective or even have the reverse effect (Stoll-Kleemann et al. 2001; Markowitz and Shariff 2012).

Here we report on the results from three separate experiments including participants from the National Audubon Society’s membership as well as members of the general public. With the data from these studies we examine four main questions. First, does placing emphasis on the collective versus personal causes of climate change produce more pro-climate behavior among environmentalists? Second, are the effects observed in a sample of environmentalists consistent with the effects observed in a general public sample? Third, do treatment-induced behavioral changes meaningfully persist over time? Fourth, do the effects of treatment on intended climate actions, a measure of desired future behavioral change, mimic the observed effects on actual behavioral change?

2 Behavioral change among environmentalists

The first question we investigate is whether emphasizing collective rather than personal responsibility for climate change is more effective at changing climate-related behaviors in environmentalists. To assess this question, we conducted an experiment embedded in an online survey emailed to affiliates of the National Audubon Society, a large wildlife conservation organization. These members are similar to many other conservationists and environmentalists across the country, who are in turn the individuals most frequently targeted with climate change advocacy messages. Our experiment assigned respondents who volunteered to complete our survey to receive either a treatment priming task of personal or collective responsibility for climate change or to receive a control task.

Experiments within the context of surveys, or ‘survey experiments’, randomly assign subjects to distinct information conditions and evaluate differences in responses across these conditions. They are frequently employed in the social sciences (Sniderman et al. 1991; Tomz and Van Houweling 2009) and have been shown to alter both actual and reported behaviors (Hassin et al. 2007; Berger et al. 2008). In our experiment, we randomly assigned each subject to receive either (a) a *personal responsibility* or (b) a *collective responsibility* essay writing task designed to prime these concepts or to receive (c), the *daily routine* essay task as a control (Hill et al. 2011). Essay tasks are common experimental tools used to focus respondents’ attention on a particular concept or emotion (Galinsky et al. 2003). We designed our treatments to produce reflection on the personal or collective causes of climate change. We present the essay conditions’ wording below (see “[Supplementary Information \(SI\): Essay content](#)” and “[SI: Collective content](#)” for details on the essay responses).

Personal *“In what ways do you cause climate change? You personally produce climate-change-causing emissions in a variety of ways. You may drive your car, fly on airplanes, and/or use fossil-fuel energy for heating or cooling, as examples. In the space below, please write a short paragraph about the ways you as an individual produce climate-change-causing emissions. How commonly do you engage in these behaviors? This paragraph should take you approximately 3–4 minutes to complete.”*

Collective *“In what ways is climate change caused? Climate-change-causing emissions are collectively produced in a variety of ways. Transportation – in the form of cars and airplanes – and the use of fossil-fuel energy for heating or cooling are examples. In the space below, please write a short paragraph about the sources of climate-change-causing emissions. How common are these sources? This paragraph should take you approximately 3–4 minutes to complete.”*

Control *“In what ways do you go about your day? You likely have daily routines that you follow. You may brush your teeth every morning and evening, have a cup of coffee with breakfast, or exercise in the afternoon, as examples. In the space below, please write a short paragraph about your regular routine. How commonly do you engage in these behaviors? This paragraph should take you approximately 3–4 minutes to complete.”*

After administering the experiment, we measured subjects’ costly decision to donate to Audubon’s climate change efforts.

Donations *In this survey, 1 out of 100 people will win \$100 (yes, we’re really going to give out cash). If you win, how many dollars of the \$100 would you like us to pay to the Audubon Society, supporting Audubon’s climate change efforts? You will receive \$100 minus whatever you instruct us to pay.*

In the Audubon sample ($n = 1,215$), random assignment to the personal responsibility essay task produced no significant difference in donations compared to the control condition (see Fig. 1, panel (a)). However, assignment to the collective responsibility essay task produced a significant increase in average dollars donated – \$5.55 more than the control condition (heteroskedasticity robust OLS t-statistic: 2.207, p-value: 0.028, Cohen’s d: 0.16; see “SI: Table S1” for a table of the regression results presented in the main text) (White 1980). This translates into a 7 % increase in donations relative to the control group. The collective task also elevated donations in comparison to the personal task, significant at the $p = 0.10$ level (heteroskedasticity robust OLS t-statistic: 1.776, p-value: 0.076, Cohen’s d: 0.12). Priming subjects to consider the collective causes of climate change pushed respondents to give more in support of climate action. Conversely, reminding respondents of their personal role in contributing to climate change led to no significant change in behavior relative to the control condition.

Figure 1, panel (b) highlights the overall high level of willingness of the Audubon sample to donate to climate change efforts. This willingness is likely driven by general support for the National Audubon Society among its members, coupled with members’ high level of belief in climate change. Ninety-four percent of Audubon respondents reported believing that the climate was changing, with over 80 % believing the changes are caused primarily by human activities. These factors produced a median donation across all treatments of \$100; the median respondent desired to give all their potential winnings to Audubon.

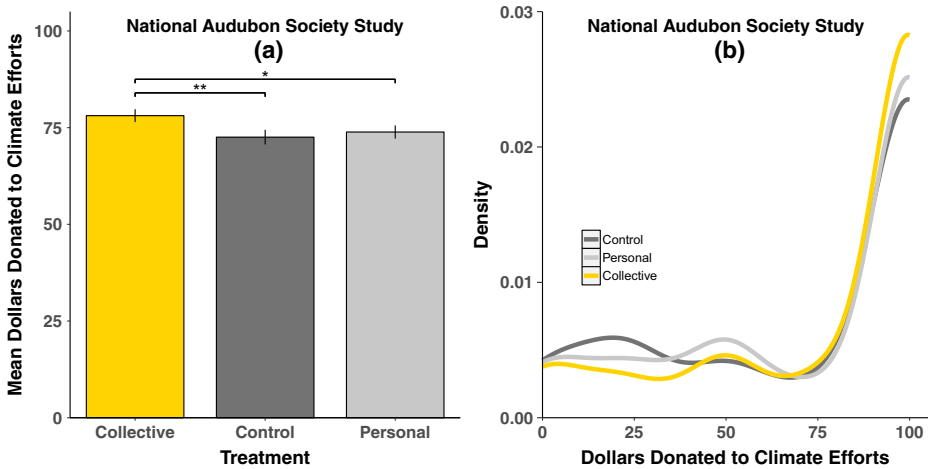


Fig. 1 Collective treatment increases donations among environmentalists. Panel **a** depicts the mean donations across treatment groups in the National Audubon Study ($n = 1,215$). One star indicates significant difference at the $p = 0.10$ level while two stars indicate a significant difference at the $p = 0.05$ level. Error bars are SEM. Panel **b** consists of kernel density plots of donations for each of the three experimental groups. Audubon affiliates gave a high amount of their potential winnings to Audubon across all conditions

3 Behavioral change among the general public

Audubon members are overwhelmingly willing to take pro-climate action, with the median donation among Audubon members falling at the highest possible amount. Further, because the median donation amount across all experimental conditions in the Audubon study is equal to the max potential donation, a ceiling effect in that study may prevent observation of the full potential effect of the treatment. These points, coupled with the importance of replication in the social sciences (Klein et al. 2014) and of reaching non-environmentalist audiences with pro-climate advocacy, raised an important question: could the effects of the experiment be replicated in the general population?

To investigate this second question, we embedded the same experiment in a survey with respondents drawn from Amazon's Mechanical Turk (MTurk) (Buhrmester et al. 2011; Berinsky et al. 2012). Like the Audubon study, our experiment again assigned respondents to receive either the personal or collective responsibility for climate change prime or the control task. We presented subjects with the same donations outcome measure used in the Audubon study. Unlike the Audubon study, all MTurk participants were compensated for their study participation via the MTurk platform.

Like the Audubon study, those assigned to the personal essay task donated an average amount that did not significantly differ from the control condition (see Fig. 2, panel (a)). However, as with the Audubon study, participants assigned to the collective responsibility condition gave significantly more. The collective subjects gave a significant \$7 more than the personal treatment (heteroskedasticity robust OLS t-statistic: 2.106, p-value: 0.036, Cohen's d : 0.30). Unlike the Audubon study, this was a substantially greater increase – 49 % – over the other treatment arms. The collective treatment gave \$6.60 more than the control on average, though this is only significant at the $p = 0.10$ level (heteroskedasticity

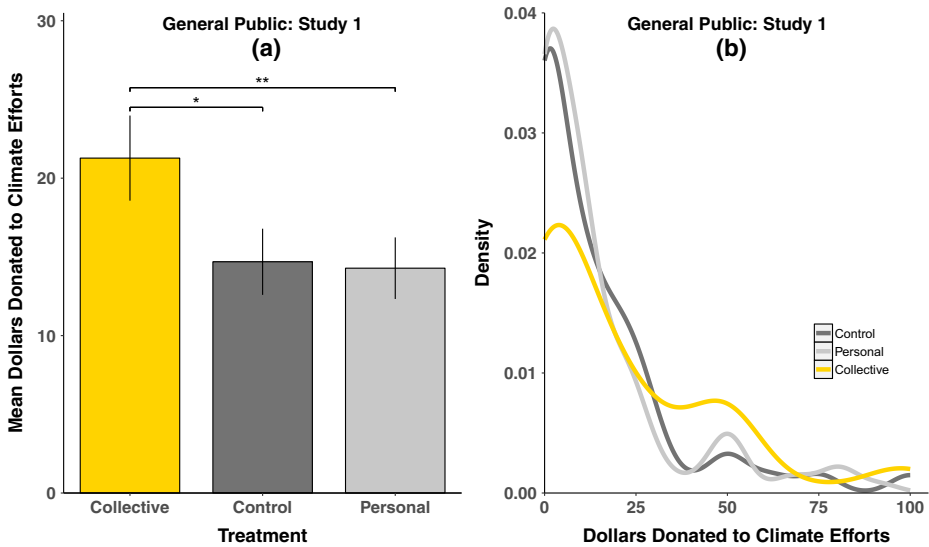


Fig. 2 Collective treatment increases donations among the general public. Panel **a** depicts the mean donations across treatment groups in the first study with workers from Amazon’s Mechanical Turk ($n = 304$). Error bars are SEM. Panel **b** consists of kernel density plots of donations for each of the three experimental groups. As compared to Audubon affiliates, MTurk subjects gave a notably lower amount of their potential winnings to the National Audubon Society across all conditions

robust OLS t-statistic: 1.933, p-value: 0.054, Cohen’s d : 0.28). The subjects drawn from MTurk differed from the Audubon sample slightly in their climate change related opinions. Around 85 % reported believing that climate change was occurring and a slightly lower percentage reported believing that climate change was primarily anthropogenically driven. The high level of climate change belief is consistent with previous findings on the political orientations of MTurk workers (Berinsky et al. 2012). Perhaps most significantly, the participants had no preexisting connection to Audubon. As a result, with a median donation of approximately \$10, MTurk subjects in this study gave substantially less on average than did Audubon affiliates (Fig. 2, panel (b)).

Because we designed the MTurk study to evaluate the same experiment using the same outcome measure from our Audubon study, we can use meta-analysis techniques to gain added insight into the our inference that the collective task outperforms both the control and personal treatment conditions. To conduct this test, we pool the data from both experiments, adding a fixed effect that controls for study specific characteristics (Riley et al. 2010). Performing this analysis, we find that the collective treatment again significantly increases donations above both the control condition (heteroskedasticity robust OLS t-statistic: 2.698, p-value: 0.007) and the personal condition (heteroskedasticity robust OLS t-statistic: 2.355, p-value: 0.018) (see “SI: Pooled analysis” for additional details).

Thus the results from both of these studies combine to suggest that personal appeals, especially ones that relate to personal responsibility for climate change, may be notably less effective both with environmentalists and the general public than collective responsibility appeals.

4 Persistence of behavioral changes

Yet, the ultimate goal of climate advocacy is to convince individuals to change their climate-related behaviors repeatedly into the future (Staats et al. 2004). This point invites our third question, whether individuals exposed to our collective treatment are still likely, days later, to give more to the cause of climate change advocacy.

To investigate this question, we followed up with our sample of MTurk workers from the general population, inviting them to take a follow up survey. Of the 304 original subjects, 78 % completed the follow up. The median time to completion of the follow up was two days from the original survey completion date. In this survey we repeated our donation outcome measure, with additional raffle money awarded. The originally observed main effect of treatment on donations persisted (Fig. 3, panel (a)). Subjects who originally received the collective treatment again gave a statistically significant \$6.80 more than did those subjects who received the personal treatment (heteroskedasticity robust OLS t-statistic: 2.16, p-value: 0.031, Cohen's d: 0.34). This represents a 54 % increase in follow up donations among the collective group compared to the personal group.

The distributions of the follow up donations closely mirror the original donation distributions with a median change of donation amount of \$0.00 and a mean change in donation amount of -\$0.08 (see Fig. 2, panel (b) as compared to Fig. 3, panel(b)). This lack of change of the median respondent is driven by the fact that 84 % of respondents who gave \$0.00 in the first donation measurement again gave \$0.00 in the follow up measurement. Ultimately, most people's subsequent donation behavior remained consistent with their earlier treatment-induced donations (see "SI: Figure S3").

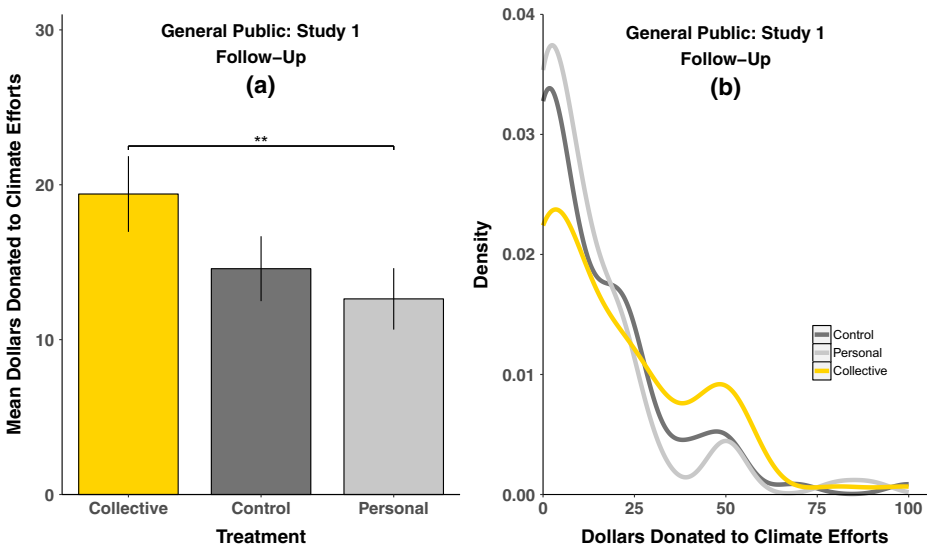


Fig. 3 Effects persist multiple days after treatment. Panel **a** depicts the mean donations across treatment groups in the follow up of the first MTurk subjects ($n = 238$). The follow up rate was 78 %. Error bars are SEM. Panel **b** consists of kernel density plots of donations for each of the three experimental groups. The donation distributions in the follow up closely mirror the original donation distributions

5 Changes in attitudes about climate-related behaviors

In addition to the replicable, persistent effects of the collective responsibility treatment on actual behaviors, our fourth question asks whether the experiment could similarly alter behavioral *intent* with respect to future climate-related behaviors. In our first three experiments we chose to focus primarily on actual costly climate-related behaviors (Howell 2014). However, because behavioral intent measures can provide insight into attitudinal changes that may in turn precipitate future behavioral changes, we investigated whether our experimental treatments could also alter projected future climate change behaviors. We recruited subjects who had not completed any of our prior surveys from MTurk. These subjects then participated in our experiment and were asked the below question, with answers recorded on a sliding scale from 0 (*very unlikely*) to 100 (*very likely*).

Behavioral Intent *How likely are you to reduce your own climate-change-causing behaviors in the future?*

In this experiment ($n = 451$), MTurk subjects assigned to the personal essay task reported an average intention to change climate-related behavior that, similar to donations in the other studies, did not significantly differ from the control condition (see Fig. 4, panel (a)). Like donations in the previous studies, those subjects assigned to the collective responsibility condition reported significantly increased intention to reduce climate-change-causing behaviors as compared to the personal responsibility condition (heteroskedasticity robust OLS t-statistic: 2.294, p-value: 0.022, Cohen’s d : 0.26). The control condition’s average behavioral intention split the difference between the other two treatments. The median intention to reduce climate causing behaviors was relatively high across all groups, with the

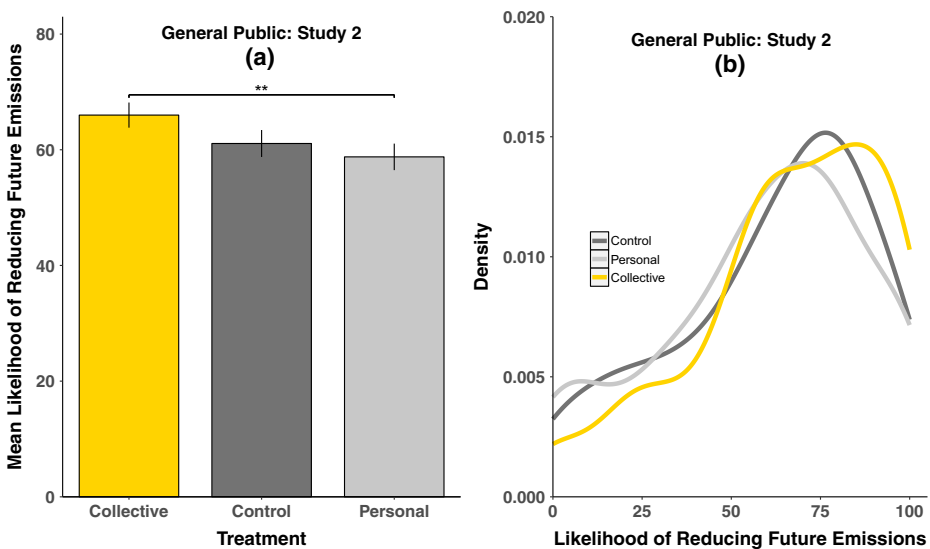


Fig. 4 Collective treatment increases willingness to reduce future emissions. Panel **a** depicts the mean intention to reduce climate-causing behaviors across treatment groups in the second study with workers from MTurk ($n = 451$). Error bars are SEM. Panel **b** consists of kernel density plots of emission reduction intentions for each of the three experimental groups. Participants reported a high intention to reduce future behaviors across all three groups, with the median highest in the collective treatment group

collective condition having the highest median intent score of 70 (Fig. 4, panel (b)). Across all the treatment groups in this sample, around 86 % reported believing that climate change was occurring, mirroring subjects' climate beliefs in the first MTurk experiment.

6 Possible explanatory mechanisms

There are several reasons why focusing on collective rather than personal responsibility could produce stronger pro-climate responses. Our data lead us to propose two possible mechanisms, though we lack definitive evidence for either. The first is the production of cognitive dissonance and subsequent reactance among personal responsibility group members. The second is the difference in construal levels for climate action animated by the personal and collective treatments, which may alter the salient motivations for taking action.

Cognitive dissonance refers to a psychological discomfort experienced by someone who holds contradictory beliefs, ideas, or values simultaneously, or who is confronted by information that conflicts with existing beliefs, ideas, or values (Festinger 1957). Dissonance often drives individuals to reduce their internal conflict by either harmonizing their beliefs with their behaviors or vice versa (Elliot and Devine 1994). Of note, cognitive dissonance may not present as an overt, conscious experience but may instead present primarily as physiological stress (Zimbardo et al. 1966).

In our studies, respondents overwhelmingly reported believing in climate change. In the personal task we asked these individuals to reflect on their contributions to this global problem – to focus on behaviors likely seen as conflicting with their own concern about climate change. Efforts to decrease this dissonance could diminish pro-climate behaviors and intentions (Doherty and Clayton 2011).

The strongest evidence that reactance motivation underlies our results is that individuals experiencing cognitive dissonance may subsequently avoid the dissonant stimulus (Zimbardo et al. 1966). In our first MTurk study, participants had the opportunity to avoid dissonant stimuli when asked to participate in the follow-up study examining duration effects several days later. If cognitive dissonance was driving avoidance, those who received the personal treatment should have been less likely to complete the follow up survey than were those who received the collective treatment. The data show that the personal group was less likely to follow up than the collective group, though this statistic is only significant at the $p = 0.10$ level (heteroskedasticity robust OLS t-statistic: 1.783, p-value: 0.076, Cohen's d : 0.25) (see Figure S1).

Additionally, attempts to reduce cognitive dissonance might also dampen feelings of guilt about climate-change-causing behaviors in the personal responsibility group (Markowitz and Shariff 2012). After treatment we presented subjects from the second MTurk study with a scale designed to measure current feelings of guilt (Wohl et al. 2006; Hibbert et al. 2007; Ferguson and Branscombe 2010). In line with the cognitive dissonance hypothesis, we observed that the state-guilt score (Kugler and Jones 1992; Jones et al. 2000) of the personal treatment group did not significantly differ from either the collective or control groups.

Construal-level theory offers a compelling alternative framework for understanding why collective responsibility could motivate climate action. In construal theory, the farther an object is from direct experience, the more abstract the construal or consideration of that object (Trope and Liberman 2010). In the context of our study, individuals in the personal condition may construe climate change and the subsequent questions regarding mitigation more proximally, whereas the collective condition may lead to a more distal construal.

Thinking about personal responsibility, for instance, could proximize ancillary considerations associated with climate mitigation, such as the personal costs and benefits of action (Fujita et al. 2014). Proximating climate change construals may further decrease the tendency to act on climate change if it draws attention away from broader environmental concerns less immediate to individual experience (Brügger et al. 2015).

If proximating climate change decreases the salience of these broader non-immediate environment concerns associated with climate change, inducing personal responsibility should produce muted negative emotional responses as compared to those assigned the collective essay task. Responses to a standardized emotion scale following treatment in our second MTurk study (n=451) revealed that the collective condition produced significantly higher levels of negative affect (commonly understood to represent fear and anxiety) than did the personal condition (heteroskedasticity robust OLS t-statistic: 2.033, p-value: 0.043, Cohen’s d: 0.23) or the control condition (heteroskedasticity robust OLS t-statistic: 3.163, p-value: 0.002, Cohen’s d: 0.37) (see Fig. 5, panel (a)) (Watson et al. 1988; Kercher 1992; Mackinnon et al. 1999). Negative affect in the personal condition did not significantly differ from the control. This treatment-induced difference in negative affect may partially explain differences in donations. Following this logic, individuals in the collective treatment group were motivated to donate to counterbalance their negative emotions stimulated by thinking of climate change with the positive feelings associated with prosocial giving (Manucia et al. 1984; Dunn et al. 2008; Aknin et al. 2012).

The purpose of this study was to test the prevailing wisdom in environmental messaging that stresses individual responsibility and action, a focus which limits our ability to causally identify mechanisms underlying the observed effect of treatment. Evidence presented here

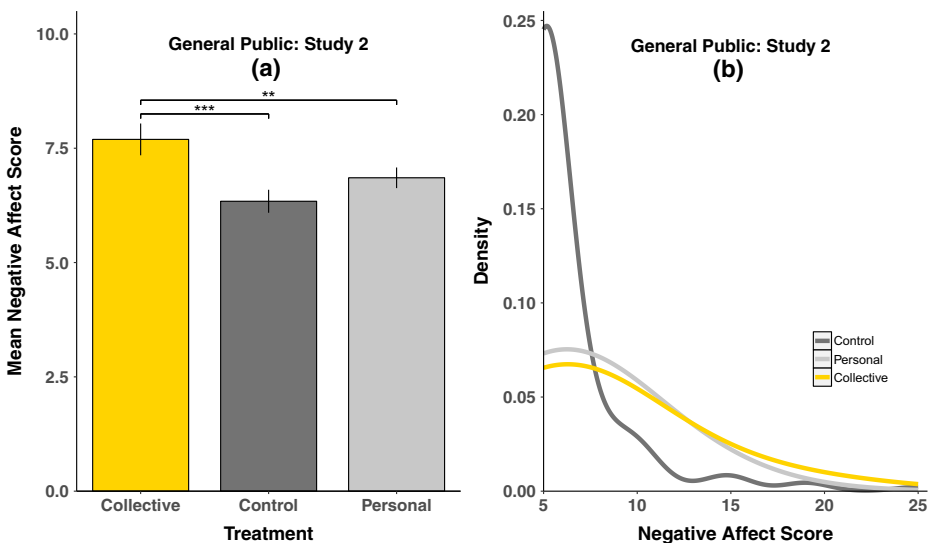


Fig. 5 Collective treatment increases negative emotions. Panel a depicts the mean score on a standardized negative affect scale (Kercher 1992) across treatment groups in the second study with MTurk workers (n = 451). Three stars indicate significant difference at the p = 0.01 level. Error bars are SEM. Panel b consists of kernel density plots of negative affect for each of the three experimental groups, with negative affect increasing along the x-axis. Participants in the control group reported the least negative affect, while individuals given the collective responsibility treatment reported the highest level of negative emotions

suggests that the collective prime induced greater negative emotion and less avoidant behavior than the personal condition. Neither condition created differential feelings of guilt. Both theories of cognitive dissonance and construal level are somewhat consistent with these findings. However, we are unable to make definitive claims or rule out other alternative explanations at this stage. Future studies may help to more concretely identify the psychological underpinnings of our results.

7 Discussion

The evidence we present suggests that emphasizing collective responsibility for climate change may be more effective at altering climate-related behaviors and attitudes. The collective responsibility treatment outperforms the control and personal responsibility treatments across multiple studies in altering both actual behavior and intentions about future behavior. The observed effects hold in both environmentalists and the general public and persist over time. The magnitude of these treatment effects, though small on an individual basis, is substantively large when put into the aggregate context of donations for climate advocacy (Cohen 1990). A 7 to 50 % increase in donations to climate advocacy would translate into millions of additional dollars raised each year.

While the combined results of our studies are strongly suggestive that collective responsibility may increase pro-climate action, our findings are subject to a handful of limitations and future studies may expand on these results in useful ways. First, the respondents across all of our studies believed more strongly in the occurrence of climate change than does the average U.S. citizen (Howe et al. 2015). Understanding how individuals inclined to care about the climate may be persuaded to increase their pro-climate behaviors is important. Yet, future studies should investigate more directly how collective framings alter climate intentions among those less supportive of climate action. Second, the use of essay writing primes may limit the external validity of our findings (Galinsky et al. 2003). Thus, examining how collective versus personal responsibility appeals in actual advocacy settings differentially stimulate pro-climate behavior would be useful to establish the limits of our findings. Third, our study could benefit from extending the time until follow up to examine whether effects persist over even longer periods of time. Fourth, future studies should examine the effect of asking respondents to donate already awarded funds, to see if this measure differs from the donation of probabilistically expected dollars. Finally, further study is needed to more precisely discern the psychological processes that underlie the behavioral differences we observe.

Ultimately, it is critical to understand the factors that drive individuals to change their ingrained climate-related behaviors. The evidence from our studies suggests highlighting personal responsibility for climate change provides insufficient motivation for actual behavioral change. Presenting climate change as a collective problem with ways to individually contribute to its solution proves to be more persuasive.

8 Methods details

We ran five separate surveys via the Qualtrics platform. For the National Audubon Society, we conducted two identical surveys contemporaneously, pooling together respondents for a total sample size of 1,215. The Audubon surveys recruited from rural and urban respondents respectively. Respondents for the Audubon study were recruited via Audubon's

affiliate email list. Those who completed the Audubon study volunteered to do so. Once the Audubon surveys had completed, we conducted the first survey of respondents via the MTurk platform ($n = 304$). After completion of that study, we conducted another survey on Qualtrics to follow up with the MTurk participants who completed the first study. These participants were again reached via the MTurk platform. Only those subjects who completed the first study were enabled to complete the follow up. Of the 304 original subjects, 238 (78.3 %) completed the follow up within the five day predetermined limit for response. After the follow up study, we conducted the second main survey via the MTurk platform ($n = 451$), our fifth survey overall, to evaluate behavioral intentions as well as the possible impacts of our treatment on respondents' emotions. Respondents across all of the MTurk studies were similarly compensated via the MTurk platform for participation in the study. We conducted no other studies related to this topic aside from those reported on here. Further, sample size was determined by the number of total respondents to the Audubon Study and was predetermined for each MTurk study, no hypothesis testing was conducted prior to the data stoppage.

On the essay tasks, Audubon participants wrote a median of 41 words, and took a median of approximately 3.5 minutes to complete the experimental task. Time to completion of the essay did not significantly vary by treatment assignment. Average essay word count was largest for the control task and did not significantly differ between the personal and collective tasks. In the first MTurk experiment, subjects wrote a median of 72 words, spending a median time of 3.2 minutes on the tasks. Respondents took longest on the collective condition, while the average time did not significantly differ between the personal and control conditions. Average essay word count was again largest for the control task and again did not significantly differ between the personal and collective tasks. Finally, the MTurk behavioral intentions subjects wrote a median of 65 words and took a median of 3.2 minutes to complete the task. Respondents took significantly longer on the collective condition than on the control, while the average time did not significantly differ between the personal and control conditions nor between the collective and personal conditions. Average essay word count was again largest for the control task and again did not significantly differ between the personal and collective tasks. Our results are robust to controlling for both essay duration and word count as well as for demographic variables (see “SI: Table S2” and “SI: Table S3”).

Our studies delivered the experimental treatments similarly across all three surveys where experiments were conducted (no experiment was conducted in the follow up MTurk study). Wording was consistent across the three administrations of treatment to achieve as exact a replication as possible. The survey opened with basic demographic questions (age, gender, zip code) followed by the experiment. Our primary outcome measures were collected immediately following treatment administration. We kept responses from those who completed the survey and answered our main outcome measures. Individuals were assigned to experimental conditions via Qualtrics' randomization tool.

Acknowledgments This work was supported by the NSF (grant #DGE0707423 to N.O.), and by the Skoll Global Threats Fund (to N.O. and S.M.G.). We thank G. Kreitler, L. Pomper, and the National Audubon Society for their assistance with recruitment and thank J. Burney, J. Fowler, E. Keenan, S. Kerosky, R. Migliorini, D. Victor, members of the UCSD Human Nature Group, and anonymous reviewers for their helpful comments.

Author contributions N.O. designed the experiment, analyzed the data, produced figures and tables, and drafted the manuscript and supplementary information. S.M.G. edited the manuscript and supplementary information. Both authors developed the research question.

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