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Future-oriented action interventions promote personal and civic climate action

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Abstract

A majority of people are concerned about climate change but under-engaged in climate action, especially civic or collective action. We integrated insights from multiple traditions of future-oriented psychological interventions focused on imagination and action planning, and we tested the resulting psychological intervention through three experimental conditions that targeted either a personal (e.g., driving less) or civic climate action (e.g., contacting elected officials about climate change), or neither. Participants then reported their intention to engage in personal and civic pro-environmental behaviors. Preregistered analyses (on N = 1,586 participants) showed that both personal and civic action interventions increased the targeted pro-environmental behavior. Furthermore, these effects extended to other other (non-targeted) pro-environmental behaviors, though only to the same category of action (personal vs. civic). In a second preregistered study, we replicated the intention effects of the civic action intervention. This study extends prior theory about the psychology of behavior change and provides practical insights to bridge the gap between climate concern and engagement in coordinated climate initiatives.

Introduction

A growing majority of Americans are concerned about climate change, but there is a gap between their attitudes and actions (Tyson et al., 2023; Bell et al., 2021; Tyson et al., 2021; Funk & Hefferon, 2019; Ballew et al., 2024). Many of those who are concerned about the consequences of climate change either do not engage in climate change mitigation or adaptation efforts, or they engage primarily in low-impact, individualized behaviors such as recycling (Leiserowitz et al., 2024; Leiserowitz et al., 2023; Selig and Guskin, 2023; Truelove and Parks, 2012; Whitmarsh, 2009). Further, personal actions are insufficient to address climate change on their own. Collective action is needed, but even fewer people engage in the civic actions or conversations needed to drive systemic change (Whitmarsh et al., 2021; Calvin et al. (IPCC), 2023; UNEP, 2020; Leiserowitz et al., 2023; Leiserowitz et al., 2024).

Collective action involves achieving shared goals through systemic change (Ostrom, 2004; Holahan & Lubell, 2016), and requires coordinated civic actions by individuals to succeed. At the individual level, collective action can take many forms, such as voting, signing petitions, participating in community initiatives, or organizing events and campaigns to influence policy. Calls for collective action often focus on these specific activities (e.g., contacting representatives) or broader objectives (e.g., transitioning to renewable energy). However, these calls can feel abstract, representing a sequence of more specific behaviors that may not seem immediately actionable to individuals from the messages commonly shared. Making collective goals more concrete and actionable for individuals may therefore be essential for catalyzing participation; we posit that if individuals could visualize collective action as a series of steps leading to a desirable future, they would be more likely to engage, thus narrowing the gap between attitudes and behaviors.

Psychological interventions have the potential to help bridge this gap. Literature on action planning, goal pursuit, self-regulation, and motivation has highlighted that psychological interventions can increase mental access to an imagined, desirable future (e.g., through imagination of the future in contrast to the present, known as mental contrasting; or through vivid imagined scenarios, known as episodic simulation). Action planning interventions can also highlight the steps necessary to achieve the goal. Overall, these psychological tools promote and support behavior change (Wang et al., 2021, Cross & Sheffield, 2017; Gollwitzer, 1999; Gollwitzer & Sheeran, 2006; Oettingen & Gollwitzer, 2010; Kirk et al., 2013; Ort & Fahr, 2022, Loy et al., 2016; Mutter et al., 2020; Hagger & Luszczynska, 2014; Rhodes et al., 2020; Hommel, 2003).

Psychological interventions target a range of psychological processes to motivate behavior change; here, we consider the complementary processes evoked by three intervention strategies: mental contrasting with implementation intentions (MCII), episodic simulation, and action planning. Mental contrasting (MC) enhances self-regulation and goal-attainment by contrasting a desired future or "wishful outcome" with the current reality, wherein the link between the desired outcome and the present creates an affordance for identifying what obstacle(s) define their distance (Gollwitzer, 1999; Gollwitzer & Sheeran, 2006; Oettingen & Gollwitzer, 2010; Kirk et al., 2013; Oettingen, 2000; Oettingen et al., 2001; Oettingen & Gollwitzer, 2010; Kappes and Oettingen, 2014). Implementation intentions (II) is a second task that can build upon MC, wherein participants describe how to overcome or prevent salient obstacles between the present reality and desired future via "if-then" plans, making the desired future more attainable (Oettingen et al., 2001; Kappes and Oettingen, 2014; Oettingen, 2000; Kappes et al., 2012; Oettingen & Gollwitzer, 2019; Oettingen & Sevincer, 2018). These tasks are more effective together (Adriaanse et al., 2010) and are often implemented together through a sequence of steps labeled *wish-outcome-obstacle-plan* (WOOP; see https://woopmylife.org/ for a generalized template). MCII has shown substantive benefits for motivation, goal pursuit, and behavior change regarding a wide range of behavioral domains, including health behaviors (Mutter et al., 2020; Ort & Fahr, 2022), academic achievement (Kappes et al., 2012; Duckworth et al., 2013), and interpersonal development or issue resolution (Oettingen et al., 2001). Targeting pro-environmental behavior, Loy et al. (2016) found that MCII effectively reduced highly motivated individuals' meat consumption relative to control participants. Beyond the environmental domain, applications of MCII to civic or collective action are also limited. Recently, Kim et al. (2025) showed that MCII also supports goal attainment in the context of contributing for the benefit of a group, particularly when participants believe their contribution will be valuable. Thus, although there is relatively robust empirical evidence that MCII can increase personal, individual goal attainment, there is only limited—though promising—evidence for its role in pro-environmental and civic action domains to date.

Episodic simulation tasks are similar to mental contrasting in that they can be used to evoke mental representations of a desired future, yet simulation entails vivid, rich, and concrete imagined scenarios with sensory details. Episodic simulation is an imagination process that plays a key role in future-oriented decision making (e.g., Schacter, Addis, & Buckner, 2008; Gaesser, Yuki, & Cikara, 2020). During episodic simulation interventions, individuals vividly imagine and describe a future scenario. These interventions have been shown to increase prosocial motivation (Gaesser et al., 2014) as well as pro-environmental (Lee et al., 2020) and prosocial behavior (Gaesser et al., 2020). Action planning is conceptually and mechanistically similar to implementation intentions, prioritizing action process elements like *when, where*, or *how* to carry out a specific behavior or how to initiate a complex, multi-step behavior (Hagger & Luszczynska, 2014; Rhodes et al., 2020; Hommel, 2003). In other words, action planning interventions may use a broader range of cue-activations related to the *process* of carrying out an action than does MCII (Hagger & Luszczynska, 2014; Rhodes et al., 2020; Hommel, 2003). Action planning serves to increase "*action* self-efficacy" or efficacy beliefs regarding executing an action (Hagger & Luszczynska, 2014).

These distinct traditions of future-oriented interventions each prioritize unique features of imagination and planning while drawing on overlapping foundations. Yet, these tools are not usually implemented within a single experimental design. In the present studies, we tested interventions that include prompts relating to mental contrasting with implementation intentions, simulation, and other action planning prompts to create a rich action-oriented imagination task regarding pro-environmental behaviors.

Spillover of pro-environmental behavior

Both individualized and coordinated civic actions are necessary to address the negative impacts of climate change. However, there has been mixed evidence regarding whether targeting personal pro-environmental behaviors can come at the cost of collective action to affect environmental or climate policy and other systemic solutions (Barnes Truelove et al., 2014; Geiger et al., 2021). For example, (Werfel et al., 2017) found that household-level pro-environmental behavior "crowds out" or replaces support for policy change. However, Sparkman et al (2021) found counterevidence that people do not tend to view sustainable behavior (individualized, personal action) as a replacement for pro-environmental policy change; on the contrary, in some cases, sustainable behavior can modestly *increase* support for policy change. Ultimately, there are open empirical questions regarding the conditions under which interventions can lead to either positive or negative spillover effects across the domain of pro-environmental behaviors, and particularly regarding personal vs. civic behaviors.

Present Studies

We extend prior research on future-oriented action interventions by focusing on pro-environmental behavior and by comparing personal (individualized) and civic action interventions. We integrate insights from the intervention approaches described above into a single intervention design that either targets a personal or a civic pro-environmental action. We first prompted participants to select their action from a subset of high-impact climate actions. Then, participants were asked to imagine their desired future (i.e., use mental contrasting), where the desired future is imagined as an outcome of a target action. We use additional questions to prompt for concrete details (i.e., episodic simulation). Participants also concretely imagined and described the *process* of engaging in the action (action planning), identified obstacles (mental contrasting), and created if-then plans for overcoming obstacles to the action implementation (implementation intentions). We expected that this combined process would increase the concreteness, actionability, and short-term relevance of desired futures, making goals and the path to achieve them more salient.

We tested these interventions in an online study using a between-subjects design. Participants imagined an action plan, envisioned the best possible outcomes of the action, an obstacle they might face, and how to overcome the obstacle for either a personal action (PAI) or a civic action (CAI). We measured intentions to engage in both civic and personal actions and compared these outcome measures with a no-intervention control group. Given that our intervention positions a target pro-environmental behavior with respect to a higher-order (superordinate) "wish" for positive environmental outcomes, we posited that it would have positive spillover effects. However, we also anticipated that spillover effects could be category-specific (that is, within the sub-domains of civic and personal action categories).

In a series of pre-registered analyses, we tested how effectively these interventions increased targeted personal or civic behavioral intentions (H1). We also tested whether these effects extended to other, non-targeted pro-environmental behaviors (H2), and whether such spillover effects were stronger within-category (i.e., for civic vs. personal action intentions, relative to a participant's intervention condition). We also explored intervention effects on the perceived impact of pro-environmental behaviors if many people did them (i.e., an action-specific measure of collective response efficacy; Swim et al., 2019), and tested intervention effects on other preregistered secondary outcomes to test other downstream psychological effects of our interventions. In this paper, we

provide the results of our pre-registered analyses and exploratory analyses, and we report secondary preregistered analyses in Supplemental Materials. We also report in the main manuscript and Supplemental Materials on findings from a replication study (Study 2) of the more novel of our interventions, the civic action intervention. In Study 2, we also measured self-reported behavior and longitudinal measures.

Methods

Overview

We collected data from online samples to test interventions that targeted either a personal (e.g., driving less) or civic climate action (e.g., contacting elected officials about climate change), or neither. Participants in each study were randomly assigned to one experimental condition (personal action intervention, civic action intervention, or no-task control conditions in Study 1; civic action intervention or no-task control conditions in Study 2). Participants assigned to experimental conditions completed an intervention, and all participants reported on a range of outcome variables including future intentions to engage in a range of personal and civic pro-environmental actions.

Preregistration and deviations from preregistered plans

This paper combines two sets of preregistered analyses (from Study 1 and Study 2) that were not originally intended to be combined. Both studies were conducted in two larger intervention tournaments as part of a series of larger projects. Because we are combining distinct studies with their own preregistered analyses, the main paper focuses on the central common analyses, namely the replication of preregistered primary analyses from Study 1. All other analyses are included in Supplemental Materials. In Study 1, we tested both personal (PAI) and civic action (CAI) interventions. Because Study 2 was not originally intended as a standalone replication study but was an extension of a subset of interventions from our first overarching intervention tournament, Study 2 only includes the civic action intervention (CAI). We report on any deviations from preregistered analyses.

Study 1 was part of a larger project that tested a variety of intervention strategies and their effects on a range of pro-environmental intentions and other psychological and behavioral outcomes. Details about the larger study are included in a separate published report (Sinclair et al., 2025a). The larger study's standard operating procedures, including our preregistered sample size, recruitment plan, overarching study design, and exclusion criteria, are available online (https://osf.io/x9c6j/overview). This paper is unique from the broader project report in that it focuses distinctly and solely on the MCII-based action planning interventions, including detailed analyses of outcomes and condition comparisons not reported elsewhere. The analyses in this manuscript were pre-registered (https://osf.io/7rwbz/overview). All procedures in this study were carried out in compliance with ethics laws and guidelines for human subjects research and were approved by the Institutional Review Board at the University of Pennsylvania. All participants provided informed consent at the time of participation. Data and code to reproduce the analyses in this manuscript and the Supplemental Materials can be found online (https://github.com/cnlab/BBPRIME-II_MCII.git).

Study 2 was conducted as part of a larger follow-up study related to the initial intervention tournament, which aimed to replicate and extend findings for a subset of high-performing interventions identified in the tournament, including longitudinal measures of self-reported behavior and psychological outcomes. This replication and

extension study (Study 2) included the CAI intervention condition, but not the PAI condition. The CAI intervention was identical to the task used in Study 1, and the core outcome variables changed only in the response scale range (for consistency with other interventions tested concurrently). The standard operating procedures for the second wave of the larger intervention tournament (https://osf.io/fvd7c/overview), and the preregistered analysis plan for this study (Study 2) (https://osf.io/q7sj8/overview) are available online. Details regarding the methods and results of Study 2 are included in Supplemental Materials.

Participants

We aimed to have 400 participants in each experimental condition (PAI, CAI) based on *a priori* power analyses, conducted as part of the larger project. Anticipating attrition and exclusions, we recruited more participants than our target sample size. Since this experiment was part of a larger study comparing several interventions to the same control group, we aimed to have twice as many control participants (n = 800) for higher precision in this control group. U.S. participants were recruited via Prolific in February 2024 and randomly assigned to either an intervention group or the control group in a between-subjects design. Participants were required to meet eligibility criteria; the details of these requirements and the sampling stratification are included in Supplemental Materials. Participants were excluded if they failed attention checks (n = 1 in Study 1, n = 0 in Study 2) or if they reported denial of anthropogenic climate change either or indicated high uncertainty and skepticism about climate change (n = 27 in Study 1, n = 40 in Study 2).

Before exclusions, the sample included 403 participants in the CAI group, 415 in the PAI group, and 867 in the control group, with higher attrition in experimental groups likely due to the inclusion of writing tasks in the experimental conditions. After exclusions, the total sample size was 1,625, with 393 in the PAI group, 382 in the CAI group, and 850 in the control group. In Study 2, our sample before exclusions included 508 participants in the CAI group, and 549 participants in the control group. After exclusions, our final sample included 411 participants in the CAI group and 528 participants in the control group. Sampling, exclusions, and demographic details from Study 2 as well as a comparison of demographics between samples are included in Supplemental Materials.

Age, gender, race, ethnicity, income, education, subjective socioeconomic status, political ideology, and political party affiliation are listed for Study 1 and Study 2 in Table 1. In Study 1, these variables did not differ between groups as per χ^2 tests. In Study 2, only political ideology differed by group (χ^2 = 17.40, p = 0.009). Analyses controlling for ideology are included in Supplemental Materials.

Table 1
Demographics of Study 1 and Study 2 samples

Variable	***Study 1***	***Study 2***	**Variable**	***Study 1***	***Study 2***
	N (%)	***N (%)***		***N (%)***	***N (%)***
Gender			Education level		
Agender, gender fluid, or genderqueer	19 (1.2%)	3 (0.3%)	Did not complete high school	12 (0.8%)	2 (0.2%)
Man	751 (46%)	464 (49%)	High school graduate (GED)	45 (3.0%)	36 (4.0%)
Gender identity not listed	2 (0.1%)	1 (0.1%)	Some college (1–4 years, no degree)	329 (22%)	119 (13%)
Non-binary	29 (1.8%)	12 (1.3%)	Associate's degree (including occupational or academic degrees)	156 (10%)	64 (7.2%)
Woman	821 (51%)	459 (49%)	Bachelor's degree (BA, BS, etc)	657 (44%)	368 (41%)
Race/Ethnicity			Master's degree (MA, MS, MENG, MSW, etc)	226 (15%)	253 (28%)
American Indian or Alaskan Native	6 (0.4%)	9 (1.0%)	Professional school degree (MD, DDC, JD, etc)	34 (2.3%)	20 (2.2%)
Black or African American	212 (13%)	200 (21%)	Doctorate degree (PhD, EdD, etc)	33 (2.2%)	32 (3.6%)
East Asian	57 (3.5%)	12 (1.3%)	Income level		
Multiple races	100 (6.2%)	33 (3.5%)	Less than $5,000	32 (2.0%)	19 (2.0%)
Native Hawaiian or Other Pacific Islander	3 (0.2%)	0 (0%)	$5,000 through $11,999	48 (3.0%)	26 (2.8%)
Racial/ethnic identity not listed	26 (1.6%)	14 (1.5%)	$12,000 through $15,999	39 (2.5%)	17 (1.8%)
South Asian	32 (2.0%)	8 (0.9%)	$16,000 through $24,999	81 (5.1%)	33 (3.6%)
Southeast Asian	37 (2.3%)	13 (1.4%)	$25,000 through $34,999	147 (9.3%)	50 (5.4%)
White	1,142 (70%)	646 (69%)	$35,000 through $49,999	210 (13%)	88 (9.5%)
Hispanic/Latine			$50,000 through $74,999	325 (20%)	186 (20%)
No	1,441 (89%)	855 (91%)	$75,000 through $99,999	271 (17%)	178 (19%)
Yes	178 (11%)	77 (8.2%)	$100,000 through $149,999	257 (16%)	210 (23%)

Variable	***Study 1***	***Study 2***	**Variable**	***Study 1***	***Study 2***
	N (%)	***N (%)***		***N (%)***	***N (%)***
			$150,000 and greater	176 (11%)	122 (13%)
Variable	*Study 1*	*Study 2*	Variable	*Study 1*	*Study 2*
	Mean (SD)	*Mean (SD)*		*Mean (SD)*	*Mean (SD)*
Subjective social status (10-pt scale)	5.00 (2.00)	6.00 (2.00)	Age	40 (14)	38 (12)

We used a mouse-tracking tool (TaskMaster) to track off-task behavior, which may indicate distraction or the use of external tools like generative AI. Participants were informed about the use of mouse-tracking and were asked not to use external aids during the task. We excluded participants who consistently spent more time off-task than on-task during the experiment, specifically on pages with writing prompts (n = 17 in Study 1, n = 62 in Study 2). At the end of the survey, we also asked participants to self-report dishonesty, distraction, or other issues during the study (with assurance that this would not impact their compensation). Participants were excluded from analysis if they reported using external aids (e.g., Google or ChatGPT) to complete the task, or if they reported answering dishonestly or not taking the survey seriously (n = 7 in Study 1, n = 0 in Study 2). Some participants were excluded for multiple reasons (n = 3 in Study 1, n = 0 in Study 2). Finally, we excluded participants who provided poor-quality responses to open-ended writing components (n = 6 in Study 1, n = 13 in Study 2). Details about this procedure are included in Supplemental Materials.

Task design

Participants were randomly assigned to either a no-task control condition or one of two experimental conditions (or in Study 2, to either control or CAI conditions). In all groups, participants selected a target climate action behavior from a list, indicating which action from the list they could most easily see themselves doing more or starting to do.

In both intervention conditions, participants were provided the following prompt: “While there are many ways to do good for [yourself/your community] and the environment, world experts (e.g., the UN Environment Programme) recommend we [PAI: change certain habits to make more sustainable choices / CAI: engage in collective action to help bring about more sustainable systems].” Participants were then asked to choose which of a list of behaviors they could most see themselves doing more in the future. To ensure participants focused on a specific high-impact pro-environmental action, participants selected a target “wish” behavior from pre-set options, rather than constructing and writing in their own goal as is typical in, e.g., the WOOP implementation of MCII (e.g., as implemented via woopmylife.org). We chose to have participants select their target behavior from a pre-set list for two reasons: we wanted to ensure that participants would be able to maximize the concreteness of the action through the action-planning framework, and we wanted to ensure that participants were prompted to pursue high-impact behaviors in terms of potential for mitigating climate change– i.e., those with the greatest potential for impact in slowing climate change (Ivanova et al., 2020).

Participants were then asked to consider it a personal goal to engage in the selected action, and to clearly imagine a future in which they take this action. In particular, participants were asked to first imagine engaging in

the action, including how, when, where, and with whom they would engage in the action, in alignment with prior action planning interventions (Hagger & Luszczynska, 2014; Rhodes et al., 2020; Hommel, 2003). Next, participants were asked to imagine the best possible outcomes of the action for themselves, their community, and the environment, drawing on the mental contrasting framework (e.g., Oettingen & Gollwitzer, 2010; Kirk et al., 2013), expanded into three construals of the desired future (personal, social, environmental outcomes). We include these additional prompts to support simulation concreteness while also emphasizing the superordinate goals of climate action, which are collective and environmental in nature. Then, participants were asked to concretely imagine the steps necessary to begin engaging in the action as if imagining taking the action immediately, again in accordance with action planning tasks. Finally, following the mental contrasting (MC) and implementation intentions (II) approach (e.g., Oettingen & Gollwitzer, 2010; Kirk et al., 2013), participants were asked to consider the biggest obstacle that could prevent them from engaging in the action, and to develop an if-then plan for overcoming this obstacle. At the end of the exercise, participants were asked to review and read aloud an overview of their responses to each prompt to strengthen the links between the pro-environmental action, desired future, obstacle to action, and if-then planning. Overall, this task incorporates the MCII framework with additional prompts for imagination and action planning.

In the **Personal Action Intervention (PAI) condition**, participants selected a personal-level climate action that they could most see themselves from the following list: driving less, flying less, paying for green energy at home, eating less red meat, or eating more vegetarian or vegan meals. To ensure that personal action options were high-impact, we conducted separate preliminary surveys to identify feasible pro-environmental behaviors that were not at ceiling for most participants (Sinclair et al., 2025a), and selected the subset of these behaviors that were associated with relatively high mitigation potential in terms of estimated reduction of greenhouse gas emissions (Ivanova et al., 2020).

In the **Civic Action Intervention (CAI) condition**, participants were first provided with a list of example initiatives that can be achieved through collective actions: “Government support to improve buses, trains, and other public transportation; Government support in paying for electric cars; Building more safe and enjoyable bike lanes and sidewalks; Government support paying for clean energy like solar power; Supporting local farmers or businesses by giving them government help; Making new green spaces like gardens for everyone; Starting or changing programs to turn food scraps into soil (composting); Starting or changing programs to stop businesses from wasting food or giving extra food to people who need it.” Then, participants selected the behavior they could most see themselves doing from the following list: contacting representatives about climate change, having conversations about climate change, donating to environmental organizations or campaigns, signing climate change related petitions, or volunteering for environmental organizations or campaigns.

In Study 2, participants in the CAI condition also selected a personal-level action they could most see themselves doing, from the same list as used in the PAI condition, though these participants did not engage in any task related to the personal-level action.

In the **Control condition**, participants were provided the same question for both personal and civic actions, and selected one behavior from each list. In the experimental conditions, participants went on to complete a guided imagination and planning exercise regarding their choice action.

Primary outcome measures

Climate Action Ratings. As described in Fig. 1, all participants were asked to provide ratings about 12 climate-relevant actions. These included seven personal-level actions (eating beef or lamb, eating vegetarian meals, eating vegan meals, driving a fuel-powered vehicle, flying by airplane, recycling, and paying for renewable energy for one's home) and five civic actions (donating, volunteering, signing petitions, contacting representatives, and talking to others about climate change). All actions were presented one at a time in a randomized order to each participant.

For each action, participants reported their current frequency of engaging in each action. Details on how current action levels were reported are described in Supplemental Materials. Participants then used 7-point scales to rate their intentions to engage in the action more/less in the future (1 = *A lot less*, 7 = *A lot more*), according to which direction would be aligned with pro-environmental impact (e.g., eating less red meat, driving less, eating more vegan meals). Participants also rated the perceived environmental impact if many people did the action more/less often (1 = *No impact*, 7 = *Very large impact*), and how easy or difficult it would be for participants to engage in each pro-environmental action more than they currently do (1 = *Very difficult*, 7 = *Very easy*).

In Study 2, the action measures were updated to 100-point scales. Details about the measured variables (including secondary outcome variables for both studies) are included in Supplemental Materials. Note that Study 2 included longitudinal measures (every other day) over a 10 day period. Longitudinal methods and measures are detailed in Supplemental Materials.

Statistical analysis

Statistical modeling. Models were fit using *lme4* (Version 1.1–26; Bates et al., 2015) and *lmerTest* (Version 3.1-3; Kuznetsova, Brockhoff, & Christensen, 2017) in R (Version 3.6.3; R Core Team, 2020). More details are included in the preregistrations for our main study (https://osf.io/x9c6j/overview) and Study 2 (https://osf.io/fvd7c/overview).

We first tested the most direct replication of prior MCII and action planning research: does engaging in the intervention task lead to higher intentions to engage in the specific chosen pro-environmental action (H1: target action intention effects)? For the H1 tests, we employed an OLS linear model with the explanatory variable being the general condition (intervention vs. control) and the outcome variable being behavioral intentions. For this test, we focused only on the action each participant indicated they could most envision themselves performing more frequently (target action). To address the fact that participants in the control condition provided two responses (selecting one action from each list of personal and civic actions), we divided the analyses into two separate models, each testing one condition-matched goal type (civic vs. personal action). Specifically, for the personal action intervention (PAI) vs. control comparison, the dataset included only behavioral intentions for the personal-level action that PAI and control participants felt they could most see themselves doing. For the civic action intervention (CAI) vs. control comparison, the dataset comprised only behavioral intentions for the civic action that CAI and control participants felt they could most see themselves doing. Our pre-registration initially specified using a single model across all groups. However, implementing this would necessitate duplicating data from control participants. The appropriate model would subsequently employ a multilevel model, which would also deviate from our pre-registered analysis. Although the pre-registered analysis is thus not included in this paper, the results are consistent with those derived from the models we included in the final analysis (see results from pre-registered model syntax in Supplemental Materials). Model syntax for analyses included in the results are shown in Supplemental Materials.

We expected to find general spillover effects of both PAI and CAI conditions. Thus, for H2 (general intention effects), we fit a multi-level linear model where the outcome variable was behavioral intentions (including all rated actions; 12 per participant) and the explanatory variable of interest was general condition (intervention vs. control), including random intercepts for each participant to account for the fact that ratings for different actions were nested within participants. We included current frequency of engaging in each action as a covariate. In an exploratory follow-up test, we looked at the effect per specific condition (PAI, CAI, and control) as the explanatory variable of interest. In our pre-registered analysis plan, we specified that we would include the target action in these analyses. In Supplemental Materials, we also show the general effects (H2) excluding the target action for each participant (that is, only non-targeted pro-environmental behaviors).

Although we expected general spillover effects, we also predicted that spillover would be stronger within than between personal and civic action intention categories. For H3 (within-category intention effects), we used two separate models. We first tested intervention effects on only personal level action intentions. In this model, we compare the main effects of group (PAI, CAI) against the control group as the reference category. We predicted that PAI but not CAI would have a positive and significant coefficient. Second, we tested intervention effects on only civic level action intentions. Similarly, we compare the main effects of group (PAI, CAI) against the control group as the reference category. We predicted that CAI, but not PAI, would have a positive and significant coefficient. Note, in this analysis, we also controlled for current engagement level in each action, and we included random intercepts for each participant to account for the fact that ratings for the different actions were nested within participants. In Supplemental Materials, we also show versions of these models excluding the target action for each participant. The models included in this paper differ from our pre-registered analyses. In our pre-registered analysis plan, we specified two models testing a main effect of group and an interaction between group and action category. While the preregistered models yield comparable results (see Supplemental Materials), the models we include in the main body of the manuscript are more easily interpretable. After identifying this (i.e., preferable model specification in Study 1), we pre-registered this approach for analyses in Study 2. For details, see Supplemental Materials.

As a robustness check, we additionally ran all analyses excluding participants whose current level of engagement in pro-environmental actions was already at ceiling for a given action (percent of observations per action: recycling = 44.8%, driving = 11.7%, vegan = 3.5%, having conversations = 2.2%, volunteering = 0.5%, signing petitions = 0.4%, contacting representatives = 0.4%). Results were quantitatively and qualitatively comparable to analyses not excluding these participants.

In an exploratory follow-up to this hypothesis test (H3), we investigated intervention effects at the level of action intentions per action item. For this analysis, we use estimated marginal means (EMM) to determine contrasts between each condition for each action item. For our exploratory analyses testing intervention effects on the perceived impact of pro-environmental actions, we followed the same procedures as H2 and H3 tests, using perceived impact as the outcome variable.

Dependent variables were z-scored across all observations to standardize the effect sizes; all models are reported with standardized coefficients. In models predicting action intentions, current frequency was also z-scored within-item and included in statistical models as a covariate. We preregistered that we would include demographic variables in hypothesis tests if they differed across conditions. No significant differences were found between groups for age, race, gender, ethnicity, income, education level, political ideology, or political party affiliation as per chi-squared tests for categorical variables and an ANOVA to test for group differences in age.

Details are included in Supplemental Materials. Statistical significance is determined based on an alpha level of $p = 0.05$. For preregistered directional hypotheses, we report one-tailed p-values, in accordance with the overarching study's standard operating procedures (https://osf.io/x9c6j/overview). For all post-hoc and exploratory analyses, we report two-tailed p-values.

We also used Pearson's chi-squared tests to determine differences between control and intervention groups regarding the pro-environmental behavior they selected in the initial task prompt (choice action). To determine which actions differed between groups, post-hoc tests used adjusted residuals with an uncorrected significance threshold of $p < .05$.

Results

Descriptive statistics (mean and standard deviation) for action intentions and current action levels are included in Table 2 for Study 1 and Table 3 for Study 2. Additional descriptive statistics and visualizations can be found in Supplemental Materials.

Table 2
Study 1 Means and SDs Among Outcome variables

Action	Current level			Future intentions		
	Control	***PAI***	***CAI***	***Control***	***PAI***	***CAI***
Recycling	7.06 (2.53)	7.03 (2.55)	7.11 (2.46)	4.83 (1.12)	4.91 (1.25)	4.88 (1.22)
Driving	6.69 (2.64)	6.86 (2.51)	6.39 (2.69)	4.13 (1.08)	4.26 (1.14)	4.20 (1.11)
Flights (estimated CO2 emissions)	833.63 (1480.16)	787.1 (1268.71)	789.14 (1363.99)	3.81 (1.01)	3.88 (0.98)	3.85 (1.03)
Vegan meals	3.68 (2.47)	3.71 (2.35)	3.71 (2.49)	4.36 (1.04)	4.56 (1.14)	4.32 (1.14)
Vegetarian meals	4.89 (2.6)	4.81 (2.54)	4.83 (2.6)	4.57 (1.06)	4.76 (1.14)	4.51 (1.12)
Eating meat	5.35 (2.01)	5.54 (1.86)	5.25 (2.11)	4.29 (0.92)	4.63 (1.13)	4.27 (0.89)
Paying for clean energy ($USD/month)	7.42 (31.3)	8.03 (34.36)	11.25 (40.5)	4.84 (1.17)	4.97 (1.12)	4.77 (1.18)
Volunteering	1.59 (1.46)	1.48 (1.33)	1.84 (1.65)	4.25 (1)	4.22 (1.03)	4.47 (1.12)
Petition	2.47 (1.8)	2.39 (1.75)	2.76 (1.78)	4.51 (1.03)	4.51 (1.05)	4.69 (1.07)
Donating ($USD/year)	24.71 (90.67)	24.42 (91.21)	34.19 (109.04)	4.43 (0.93)	4.48 (0.88)	4.62 (1.13)
Contacting representatives	1.70 (1.52)	1.67 (1.42)	1.90 (1.6)	4.27 (1.02)	4.32 (0.97)	4.50 (1.02)
Conversations	4.63 (2)	4.56 (2.2)	4.89 (1.95)	4.48 (0.93)	4.53 (0.94)	4.75 (1)

Note. Table shows mean (SD) for current level of engagement and future intentions for each action measured. These data are also visualized in Supplemental Materials. For all actions except flights (in estimated kilograms of CO2 emissions), paying for clean energy (in USD) and donation (in USD), current action levels reflect responses on a 9-point frequency scale (1 = *Never*, 9 = *Every day* for civic actions or or *Multiple times per day* for personal actions). All future intentions reflect responses on a 7-point scale of engaging in the action more/less in the future (1 = *A lot less*, 7 = *A lot more*). Flights, donations, and payment for clean energy are winsorized to the 99th percentile.

Table 3
Study 2 Means and SDs Among Outcome variables

Action	Current level		Future intentions	
	Control	*CAI*	*Control*	*CAI*
Driving	6.89 (2.35)	6.60 (2.53)	54.54 (24.70)	55.8 (24.72)
Flights (estimated CO2 emissions)	2358.33 (3940.02)	2247.45 (3848.09)	50.36 (23.70)	51.09 (22.48)
Vegan/vegetarian meals	5.30 (2.53)	4.96 (2.6)	64.13 (23.80)	61.12 (25.07)
Eating meat	5.82 (1.79)	5.69 (1.9)	54.38 (22.77)	55.21 (22.07)
Paying for clean energy ($USD/month)	5.25 (7.92)	4.06 (7.04)	67.58 (22.28)	67.52 (23.41)
Volunteering	3.07 (2.4)	3.01 (2.36)	60.2 (23.17)	61.59 (24.62)
Petition	3.26 (2.17)	3.29 (2.11)	62.2 (23.48)	64.9 (23.48)
Donating ($USD/year)	194.73 (644.48)	229.52 (760.67)	63.08 (23.19)	62.46 (23.56)
Contacting representatives	2.71 (2.2)	2.6 (2.18)	58.06 (24.21)	59.84 (25.61)
Conversations	5.48 (2.07)	5.38 (2.14)	69.36 (19.81)	70.53 (21.76)

Note. Table shows mean (SD) for current level of engagement and future intentions for each action measured. These data are also visualized in Supplemental Materials. For all actions except flights (in estimated kilograms of CO2 emissions), paying for clean energy (in USD) and donation (in USD), current action levels reflect responses on a 9-point frequency scale (1 = *Never*, 9 = *Every day* for civic actions or or *Multiple times per day* for personal actions). All future intentions reflect responses on a 100-point scale of engaging in the action more/less in the future (1 = *A lot less*, 100 = *A lot more*). Flights, donations, and payment for clean energy are winsorized to the 99th percentile.

H1: Intervention effects on intentions for specific, participant-selected actions

We first tested whether participants reported higher intentions to engage in the target pro-environmental action they chose to focus on in the intervention task **(H1: target action intention effects)**, compared to the intentions of control participants who also selected an action they could see themselves doing, but who did not complete any intervention task regarding their target action. We find strong support for this first hypothesis. In study 1, individuals who completed an intervention task reported higher intentions to engage in their chosen behavior than participants in the control group who simply selected a behavior that they could most see themselves doing in the future, but did not engage in any intervention. This was true for both personal action intervention (β = 0.26, CI = 0.13–0.39, p < 0.001), and civic action intervention (β = 0.43, CI = 0.32–0.55, p < 0.001). Results are reported

in Table 4. In a post-hoc *z*-test (calculating the *z*-score of the difference in coefficients), we found that the difference in effects between CAI and PAI is weak but statistically significant (difference = 0.18, z = 1.98, two-tailed p = 0.048). In Study 2 (Table 5), we replicated these effects for CAI relative to control (β = 0.19, CI = 0.08–0.29, two-tailed p < 0.001). In Study 2, CAI participants also indicated which personal-level behavior they could most see themselves doing. In an exploratory analysis, we found no effect of CAI on the participant-selected *personal* action (β = 0.06, CI = -0.06–0.18, two-tailed p = 0.350). We thus replicated our findings, despite a more balanced sample regarding political ideology and political party affiliation in the Study 2 sample (see comparison of samples in Supplemental Materials). Effects were consistent accounting for ideology (see Supplemental Materials for this analysis in both the main study and Study 2).

H2: Generalized intervention effects on action intentions

Next, we tested whether the intervention effects generalize to impact people's intentions to perform other pro-environmental behaviors that were not specifically the focus of the intervention task. We predicted that participants would report higher overall pro-environmental behavioral intentions, averaged across all behaviors, after engaging in the intervention for their chosen behavior **(H2: general intention effects).** Consistent with this hypothesis, participants completing either intervention reported significantly higher intentions to engage in pro-environmental behaviors, collapsing across all measured actions (β = 0.09, CI = 0.04–0.13, p < 0.001). In a follow-up analysis looking at each intervention condition, this effect was significant for both personal action intervention (β = 0.10, CI = 0.04–0.16, two-tailed p = 0.001) and civic action intervention groups (β = 0.08, CI = 0.02–0.13, two-tailed p = 0.011; see Fig. 2). Details for these models are included in Table 4. As per our pre-registered analysis plan, these effects included the target action. Results for alternative analyses that excluded the target action (looking only at non-targeted pro-environmental behaviors), produced similar conclusions, and can be found in Supplemental Materials.

This analysis in the Study 2 (Fig. 3, Table 5) sample also yielded significant results comparing CAI to control across all action intentions (β = 0.09, CI = 0.02–0.15, p = 0.004). Note that based on the full set of results observed in Study 1, we did not preregister this general spillover analysis in Study 2, though we did replicate the effect (Fig. 3).

Table 4
Study 1 model summaries for H1 and H2 tests

DV	*N*	Marginal R^2 / Conditional R^2	*Variable*	*Estimate*	*CI*	*Statistic*	*p*
H1: PAI target action intentions	1213	0.012 / 0.011	Intercept	0.24	0.16–0.31	6.31	**< 0.001**
			Group (PAI)	0.26	0.13–0.39	3.83	**< 0.001**
H1: CAI target action intentions	1208	0.045 / 0.044	Intercept	0.15	0.09–0.22	4.82	**< 0.001**
			Group (CAI)	0.43	0.32–0.55	7.53	**< 0.001**
H2: general intentions	1586	0.019 / 0.178	Intercept	-0.04	-0.07 – -0.01	-2.52	**0.006**
			Group (PAI or CAI)	0.09	0.04–0.13	3.67	**< 0.001**
			Current action level	0.13	0.12–0.14	18.39	**< 0.001**
H2 *post-hoc*: general intentions	1586	0.019 / 0.178	Intercept	-0.04	-0.07 – -0.01	-2.51	**0.012***
			Group (PAI)	0.10	0.04–0.16	3.38	**0.001***
			Group (CAI)	0.08	0.02–0.13	2.55	**0.011***
			Current action level	0.13	0.12–0.14	18.40	**< 0.001***

Note. Estimates are standardized regression coefficients and statistics are t-values. * indicates two-tailed p-values for post-hoc tests.

Table 5
Study 2 model summaries for H1 and H2 tests

DV	*N*	Marginal R^2 / Conditional R^2	*Variable*	*Estimate*	*CI*	*Statistic*	*p*
H1: CAI target action intentions	846	0.144 / 0.142	Intercept	0.18	0.10–0.25	4.74	**< 0.001**
			Group (CAI)	0.19	0.08–0.29	3.48	**< 0.001**
			Current action level	0.30	0.25–0.35	11.13	**< 0.001**
H2: general intentions	939	0.035 / 0.215	Intercept	-0.10	-0.15 – -0.06	-4.87	**< 0.001**
			Group (CAI)	0.09	0.02–0.15	2.70	**0.004**
			Current action level	0.17	0.16–0.19	17.60	**< 0.001**

Note. Estimates are standardized regression coefficients and statistics are t-values.

H3: Effects on intentions for civic vs. personal action types

We also hypothesized that the interventions would have greater effects on within-category action intentions, meaning that the civic action intervention would specifically increase civic action intentions relative to the personal action intervention and control groups, whereas the personal action intervention would increase personal action intentions relative to the civic action intervention and control groups **(H3: within-category intention effects)**. We find evidence for both parts of this hypothesis; civic action intervention (CAI) increased intentions to engage in civic action behaviors (β = 0.17, CI = 0.10–0.25, p < 0.001) but personal action intervention (PAI) does not (β = 0.03, CI = -0.05–0.11, p = 0.231). Likewise, PAI increased intentions to engage in personal actions (β = 0.15, CI = 0.09–0.21, p < 0.001), but CAI did not (β = 0.00, CI = -0.06–0.06, p = 0.486). Details from these models are included in Table 6. Model-estimated means and confidence intervals per condition and per action category are visualized in Fig. 4.

In our preregistered Study 2 replication of category specific spillover effects (H3, reported in Table 6), we found that CAI increased civic action intentions relative to control (β = 0.13, CI = 0.04–0.22, p = 0.002) but not personal action intentions (β = 0.03, CI = -0.03–0.09, p = 0.179). Model-estimated means and confidence intervals per condition and per action category are visualized in Fig. 5. In an exploratory analysis, we confirmed that the effects of CAI on civic action intentions hold when excluding the target action from analysis (β = 0.13, CI = 0.03–0.22, two-tailed p = 0.014). Details of these analyses are included in Supplemental Materials.

Table 6
Model summaries for within-category intervention effects (H3)

		Personal action intentions				*Civic action intentions*			
Sample	Predictors	Estimates	CI	Statistic	p	Estimates	CI	Statistic	p
Study 1 *(N = 1586)*	Intercept	-0.04	-0.07–0.00	-2.08	**0.019**	-0.05	-0.09–0.00	-2.15	**0.016**
	PAI	**0.15**	**0.09–0.21**	**4.81**	**< 0.001**	0.03	-0.05–0.11	0.74	0.231
	CAI	0.00	-0.06–0.06	-0.04	0.486	**0.17**	**0.10–0.25**	**4.46**	**< 0.001**
	Current action level	**0.08**	**0.06–0.10**	**7.91**	**< 0.001**	**0.18**	**0.16–0.20**	**17.84**	**< 0.001**
Study 2 (N = 939)	Intercept	-0.22	-0.26 – -0.18	-10.37	**< 0.001**	0.02	-0.04–0.08	0.68	0.249
	CAI	0.03	-0.03–0.09	0.92	0.179	0.13	0.04–0.22	2.96	**0.002**
	Current action level	0.05	0.03–0.08	3.79	**< 0.001**	0.25	0.22–0.27	19.52	**< 0.001**

Note. Model outputs testing intervention effects per action category (H3). In the left model, we compared the effects of the personal action intervention (PAI, Study 1 only) and civic action intervention (CAI) against the control group with *personal* action intentions as the outcome variable. In the right model, we compared the effects of the personal action intervention (PAI, Study 1 only) and civic action intervention (CAI) against the control group with *civic* action intentions as the outcome variable. These models both control for current action level and include a random intercept for each participant. For the left model (personal action intentions), Marginal R^2 = 0.009 and Conditional R^2 = 0.118 in Study 1, and Marginal R^2 = 0.017 and Conditional R^2 = 0.134 in Study 2. For the right model (civic action intentions), the Marginal R^2 = 0.047 and Conditional R^2 = 0.410 in Study 1, and Marginal R^2 = 0.079 and Conditional R^2 = 0.518 in Study 2.

In an exploratory follow-up analysis, we also investigated the effect of each intervention on each specific type of action. In this analysis we found results that were fully consistent across every type of civic action intervention target; in other words, the effect of the civic action intervention was consistent across each of the civic action behaviors, but not for personal action behaviors. Participants who completed the civic action intervention task for *any* of the civic action behaviors reported higher intentions to engage in *every* civic action. These spillover effects were significant when comparing the civic action intervention and control conditions, as well as the civic and personal action intervention conditions. These results, visualized as model-estimated means per each condition, are shown in Fig. 6. In Study 2, we found similar effects; participants who completed the civic action intervention task for any of the civic action behaviors reported higher intentions to engage in every civic action except for donating (see Supplemental Materials for details of this analysis). We note that participants in Study 2 reported much higher current annual donations than participants in Study 1 across both conditions, which may explain this null effect for donating in Study 2 (see Tables 2 and 3). The results across personal action intervention targets were more variable; for personal actions, the effect held in both comparisons only for home energy use, dietary changes (more vegetarian meals, more vegan meals, less red meat), and for the personal

action intervention vs. control alone for car use (driving less). These results are shown in Fig. 7 as model-estimated means per each condition. Estimated marginal means for each action type are included in Supplemental Materials.

Exploratory analyses: civic vs. personal action intervention effects on perceived environmental impact of actions

In a set of exploratory analyses, we also tested whether the interventions increased not just intentions but also the perceived impact of actions—in particular, how impactful each pro-environmental action would be *if many people engaged in it*. Both the personal and civic action interventions increased the perceived impact of the specific action participants chose (PAI: β = 0.16, CI = 0.04–0.27, two-tailed p = 0.007; CAI: β = 0.38, CI = 0.26–0.49, two-tailed p < 0.001). This finding was directionally similar but not significant in Study 2 for CAI (β = 0.12, CI = -0.01–0.25, two-tailed p = 0.066). In Study 1, we also found that there was a generalized spillover effect of the interventions on the perceived impact of other pro-environmental actions, but this did not replicate in Study 2. Details of this analysis for both studies are included in Supplemental Materials.

Self-reported behavior in Study 2 “daily diaries”

Study 2 also included longitudinal daily-diary surveys collected every other day over 10 days, in which participants reported their climate-relevant behaviors and other measures, and completed additional intention measures on the final day (details included in the methods reported in Supplemental Materials). However, when comparing the CAI condition with the control group, we found no significant longitudinal effects on self-reported daily behaviors or long-term intentions over the 10 day period. Notably, however, participants in the CAI condition (as well as other groups tested) did report engaging in various personal and civic climate actions during the 10-day post-intervention period (details reported in Supplemental Materials). Intervention and control group participants alike selected target climate actions and were prompted to repeatedly reflect and report on climate-related behaviors, conversations, thoughts, media consumption, and emotions during the longitudinal period. We found that across groups, behavioral rates increased across the ten days. Thus, it is possible that this procedure increased engagement in climate actions across groups, making it difficult to discern differences between the intervention and control groups. All analyses from the longitudinal study period are included in Supplemental Materials.

We explored potential indirect effects of the intervention on rates of engaging in target behaviors via behavioral intentions, using structural equation modeling. We observed an an indirect effect of the intervention on reported target action behavior through target civic action intentions (a*b path: β = 0.20, 95% CI [0.09, 0.34]), but no indirect effect on behavior for personal action intentions (a*b path: β = 0.10, 95% CI [-0.03, 0.24]). Full results are reported in Supplemental Materials.

Discussion

Although the majority of U.S. adults (64%) express worry about climate change, fewer engage in efforts to foster social, systemic, and political changes for a sustainable future (Leiserowitz, 2024). In our two studies, we tested whether psychological interventions that integrated insights from mental contrasting with implementation intentions (MCII), episodic simulation, and action planning interventions could increase intentions to engage in personal and civic climate actions. Our findings contribute new evidence that scalable online interventions can

effectively increase intentions to engage in both personal and civic climate actions, potentially supporting broader engagement at scale.

Increased intentions to engage in the target action

In particular, our findings make a novel contribution by showing that a future-oriented action intervention that integrates approaches from across intervention literatures—mental contrasting with implementation intentions (MCII), action planning, and episodic simulation—can enhance intentions to engage in *civic* actions, suggesting that psychological interventions may effectively promote collective engagement, not just personal behavior change. This is especially notable given the novel recombination of psychological intervention tasks, and that participants in these studies chose an action from a list as their target for the intervention task, rather than having participants come up with their own goal as is more typical in, e.g., MCII interventions. Our results align with recent findings from Sabherwal et al. (2026), which demonstrated that combining interventions to address complementary psychological barriers or both individual and collective scales of change were more effective than single-level or single-mechanism interventions alone. We also asked participants about positive outcomes not only for themselves, but also for their community and the environment. Thus, our intervention extends prior work on action planning (Hagger & Luszczynska, 2014; Rhodes et al., 2020; Hommel, 2003) and MCII (Gollwitzer, 1999; Gollwitzer and Sheeran, 2006; Oettingen & Gollwitzer, 2010; Kirk et al., 2013; Mutter et al., 2020; Ort and Fahr, 2022, Loy et al., 2016; Wang et al., 2021, Cross & Sheffield, 2017; Oettingen, 2000; Oettingen et al., 2001) to show that both personal and collective action interventions increased intentions to engage in the target action. In exploratory analyses, we found that participants completing our interventions also reported a higher perceived impact of their target action than control participants, which we take as evidence that the intervention task successfully links the individual's actions to the broad desired environmental outcome (Oettingen, 2000; Oettingen et al., 2001).

In prior research, there has been mixed evidence for psychological interventions promoting collective climate action. For example, video interventions (including hypothetical futures resulting from climate action) in Castiglione et al. (2022) did not succeed in boosting intentions or engagement in collective climate actions, possibly because the content was informational and passive rather than generative and participatory, and it did not involve an implementation intentions or action planning component. Similarly, Vlasceanu et al. (2024) tested various psychological interventions across 63 countries, providing cross-cultural evidence for the positive impact of psychological tools on pro-environmental outcomes (e.g., belief in climate change, policy support). However, the study focused less on collective action intentions and engagement, did not include any MCII or action planning interventions, and no intervention notably increased climate action, with some even backfiring. Kim et al. (2025) showed that MCII can promote self-regulation in the context of contributing to a group, though this work did not focus on collective action behaviors in the civic or political realm. Our findings demonstrate new evidence that psychological interventions focusing on future behavior can increase personal *and* civic climate action intentions.

Spillover effects

We also found compelling evidence that our interventions affect not only the specific action targeted in the intervention task, but also other pro-environmental behaviors. This was true for both the personal action intervention as well as the civic action intervention, providing evidence that these psychological interventions can have generalized effects on broad categories of actions, not only a specific action that is the target of the

intervention. This is consistent with prior theory and empirical evidence showing that engaging in a single pro-environmental behavior can increase engagement in other pro-environmental behaviors (Lauren et al., 2016; Lauren et al., 2019; Truelove et al., 2014; Carrico, 2021). However, in a meta-analysis of intervention spillover effects, Geiger et al. (2021) found only weak evidence for positive spillover for sustainable behavior intentions and no evidence for behavioral spillover effects. Our findings offer evidence that imagining and planning to engage in a pro-environmental behavior can lead to spillover effects on pro-environmental intentions. Here, we show that our intervention tasks can create positive spillover in the pro-environmental action domain; that is, imagining and planning to engage in one pro-environmental action can increase other pro-environmental intentions as well.

From these studies, we cannot yet test what underlying mechanisms explain the observed spillover effects. We postulate that although the intervention task itself is constrained to imagining and planning a particular pro-environmental action, the task evokes an intention or behavioral goal that is more abstract than the particular target action. That is, the underlying "wish" participants elaborate on in the intervention is more about working towards pro-environmental outcomes than about enacting the specific target behavior as the end-goal itself. In other words, the target action is utilized as a means to a bigger end. The mental contrasting process of imagining positive personal, social, and environmental outcomes of action creates a link between one's own action and a desirable pro-environmental outcome and makes pro-environmental actions towards that desired future feel more possible (Oettingen, 2000; Oettingen et al., 2001; Oettingen & Gollwitzer, 2010; Kappes and Oettingen, 2014; Kappes et al., 2012; Oettingen & Gollwitzer, 2019). This link transcends the specific target action, perhaps because the ultimate high-level goal is outcome-oriented, attainable through multiple action pathways. The goal itself is more superordinate than "taking action X," but is situated as "taking action X" to move *towards* the broader pro-environmental goal. Thus, our evidence is consistent with the theoretical framework posed by Höchli et al. (2018), which articulates the logic of how superordinate goals could promote positive spillover effects. The action planning modifications to the MCII task could support a sense of efficacy about this action-outcome link, as participants are specifically prompted to represent the action sequence which may otherwise be represented too abstractly to be navigable. In line with this view, the task increases self-efficacy in both samples (see Supplemental Materials).

Category-specific spillover effects

We also found evidence, however, that spillover effects were category-specific. The civic action intervention increased intentions to engage in other civic actions but not in personal action behaviors, while the personal action intervention planning increased intentions for other personal actions but not civic actions. We did not find any negative spillover effects between categories, which is inconsistent with findings from a recent study by Goldwert et al. (2025), which found that making commitments to engage in personal climate actions decreased civic action intentions. Our findings demonstrate that intentions to engage in either personal or civic climate action benefited uniquely from imagining and planning a same-category climate action behavior, with no significant effects on out-category action intentions. Although we cannot determine the exact mechanism underlying these observed effects from these studies alone, we postulate that there is a unique set of representations evoked by imagining civic actions and personal actions, respectively. Consistent with the idea that the task evokes superordinate pro-environmental goals, it is possible that superordinate collective and personal action goals are categorically distinct, and/or that they fulfill different self and socially focused motives. One possible explanation for this is that imagining and planning collective action behaviors may evoke social representations such as an orientation towards institutional, structural change through coordinated action with

others sharing an aligned wish or goal, whereas this process may evoke more self-focused representations for personal action behaviors. In this way, the imagination phase might prime different psychological stances that guide different orientations toward larger goals.

Collective action representation and planning may also evoke more social cognitive processing or greater anticipation of others' actions in line with a collective goal (Sebanz et al., 2006; Kulis et al., 2022; Kourtis et al., 2019; Tomasello et al., 2005). This could explain the within-category generalized effects of the civic action intervention, as well as its effects on perceived impact even for personal actions in Study 1. Since collective action relates to coordinated actions of multiple individuals, collective (civic) action planning may require representation of the collective goals and the actions of others, as well as consideration of one's own position within these collective efforts. Our findings show that civic action planning, in particular, can increase participants' sense that people can achieve things together, through emergent (via individualized behavior change) as well as coordinated collective change. Future work can test whether civic or collective action planning tasks may evoke greater social cognitive processes and consideration of others' behavior relative to personal action planning.

It is possible that civic action planning also promotes the salience of a collective identity; in past research, greater identification with a group engaging in collective action has been related to greater support for or participation in collective action (van Zomeren et al., 2008; Klandermans & de Weerd, 2000; Kelly & Kelly, 1994; Simon, 1998; Wright & Tropp, 2002). Future research can also address this possible pathway that distinguishes civic or collective action planning from personal action planning, and intervention effects on the salience of collective identification. We also hope to test synergistic effects of the civic action intervention with other design tools that can promote climate action in future work, such as by translating the task into more interactive activities. In our data from both studies, the most common civic action behavior that individuals could see themselves doing more of in the future was having conversations about climate change (see Supplemental Materials), though participants did *not* rate this action as the easiest to engage in per an exploratory follow-up analysis (see Supplemental Materials). There have been a number of resources made available by climate organizations and researchers (e.g., The Nature Conservancy, 2023, *Talk Climate Change*; Ettinger et al., 2023, *Seeding Action*) to facilitate climate change conversations, the prevalence of which is linked to other forms of civic and collective engagement (Ballew et al., 2023; Ettinger et al., 2023). Mental contrasting with implementation intentions, and action planning paired with access to resources for key behaviors of interest could provide even greater effects on both intentions and downstream civic and collective action behavior.

Limitations and future directions

This study has several strengths, including a well-powered extension of a theory-driven intervention and a replication of primary analyses for the civic action intervention condition. The results, however, should also be interpreted in the context of limitations that can also serve as inspiration for future research. First, this study measures intentions as the primary outcome, not actual behavior. We did not observe direct effects on behavior, although we did find evidence for an indirect effect of the civic action intervention on behavior through intentions, and intentions are well established precursors of behavior change (Fishbein & Ajzen, 1975; Ajzen, 1991; Fishbein & Cappella, 2006, Sinclair et al., 2025b). Thus, future research that more directly measures behavioral outcomes would strengthen the evidence of intervention effectiveness on climate relevant behaviors. In Study 2, we included short-term longitudinal measures including self-reported behavior and intentions 10 days after the intervention, and observed no significant differences between CAI and control groups in these outcomes (see

Supplemental Materials). This indicates that the intervention effects are immediate but may be short-lived or not well operationalized by our initial longitudinal design. It is worth noting, however, that the control group was also asked to reflect and report on climate-related behaviors, thoughts, emotions, conversations, media consumption, etc., repeatedly throughout the longitudinal phase, including reminders of the actions they selected as “targets”; these repeated prompts to consider climate change and climate actions may be an intervention in itself, making our comparison weaker. Although the intervention is thus promising, these findings indicate that future research could benefit by testing a stricter control, testing behavioral effects at the time of intervention (e.g., within-study donations, contact forms for reaching elected officials, sign-ups for volunteering, immediate opportunities to engage in climate conversations, etc), and testing repeated action intervention “dosage” effects. We also note that our second sample was balanced with respect to political ideology (see demographic details in Supplemental Materials), and future research can explore the effects of this intervention both immediately and longitudinally across individuals with different beliefs and attitudes about climate change to better determine for whom and how this intervention works. We also believe the intervention can be adapted into longer-form, more involved formats.

Future work can also test more nuanced manipulations of civic vs. personal actions to uncover the mechanistic drivers of the within-category specificity of spillover effects we observed. Understanding additional barriers that might prevent a person from acting on their intentions and the network of beliefs surrounding each type of action studied here is a key interest for future research. Finally, future work can expand on the application of these interventions to test their generalizability in non-U.S. samples and in domains beyond climate change; there is little work on the cross-cultural effects of MCII, yet evidence suggests variability across cultures and obstacle type (Kizilcec & Cohen, 2017). In future partnerships, this intervention could be adapted into more interactive online tools, pen-and-paper exercises, or workshop formats to improve collective goal setting in a variety of advocacy or institutional settings. Through bridging existing work and developing more nuanced mechanistic understandings of how to encourage action in those who care, we can cultivate a more active public and shape a sustainable future.

Conclusion

We have shown that theory-informed psychological interventions, consisting of a simple set of writing prompts, can shift both personal and civic action intentions around climate change. We have also shown that these interventions, which blend multiple intervention strategies from the goal pursuit, self-regulation, and behavior change literatures, can increase *civic* action intentions in a targeted manner, though the task is completed by individuals in isolation. These interventions not only affected people’s intentions to engage in a specific target action, but broadly increased pro-environmental intentions within civic (collective) or personal action categories. Our studies yield a range of theoretical and mechanistic questions for future research, as well as new insights towards practical efforts to engage individuals in the collective change to benefit our planet.

Declarations

Declarations of interest: None

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Data and code availability statement: The datasets and code used for analyses are available in a Github repository: https://github.com/cnlab/BBPRIME-II_MCII.git. Code but not data are available for analyses using demographics data, to ensure participant confidentiality.

Study Standard Operating Procedures and pre-registrations:

Study 1 SOP: https://osf.io/x9c6j/overview

Study 1 preregistration: https://osf.io/7rwbz/overview

Study 2 SOP: https://osf.io/fvd7c/overview

Study 2 preregistration: https://osf.io/q7sj8/overview

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Figures

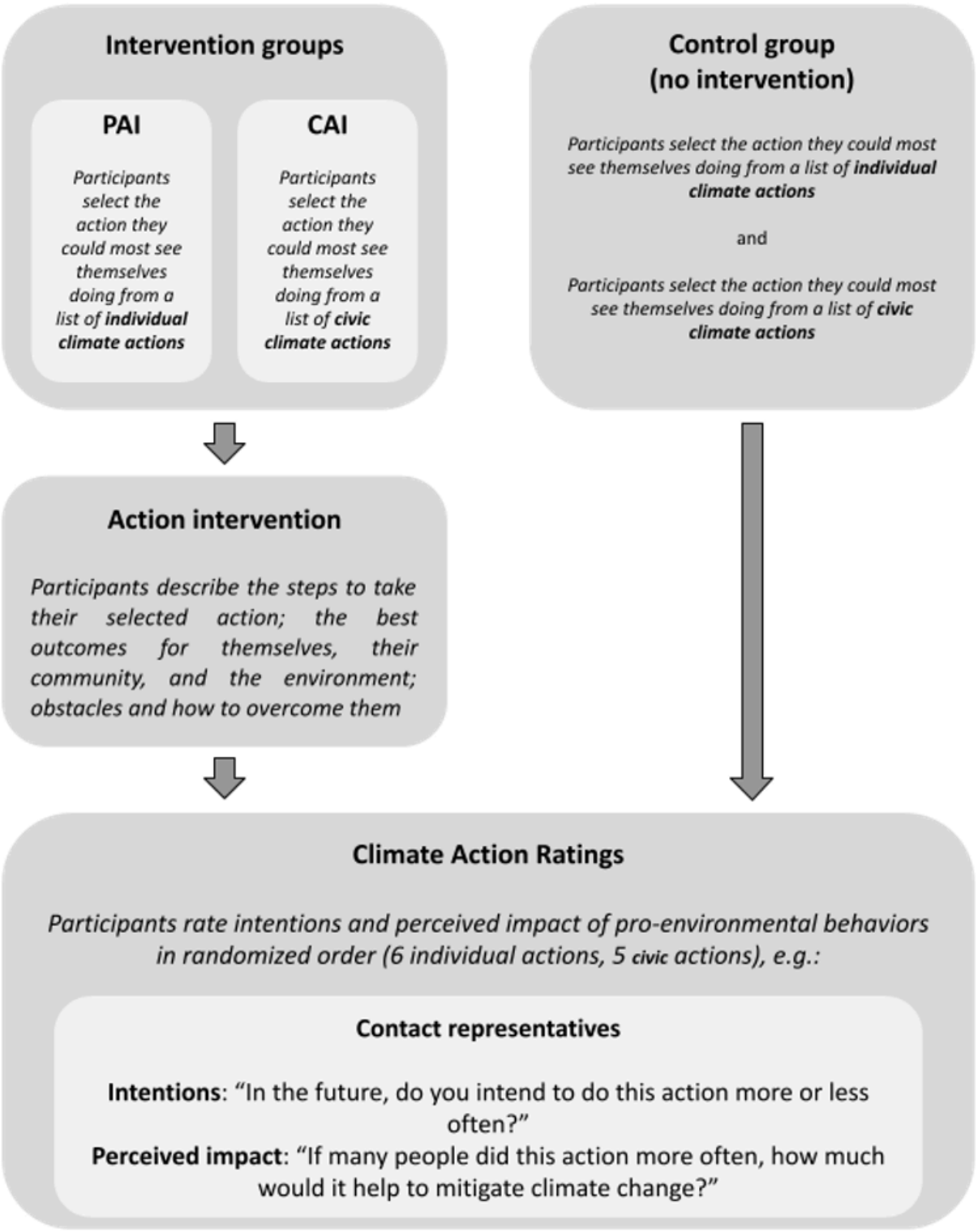


Figure 1

Overview of methods (Study 1)

Note. In Study 1, participants were randomly assigned to one of three conditions: personal action intervention (PAI), civic action intervention (CAI) or a no-intervention control group. Participants selected an action from a list that they could most see themselves doing in the future. PAI participants selected an option from a list of personal actions, CAI participants selected an option from a list of civic actions, and control group participants

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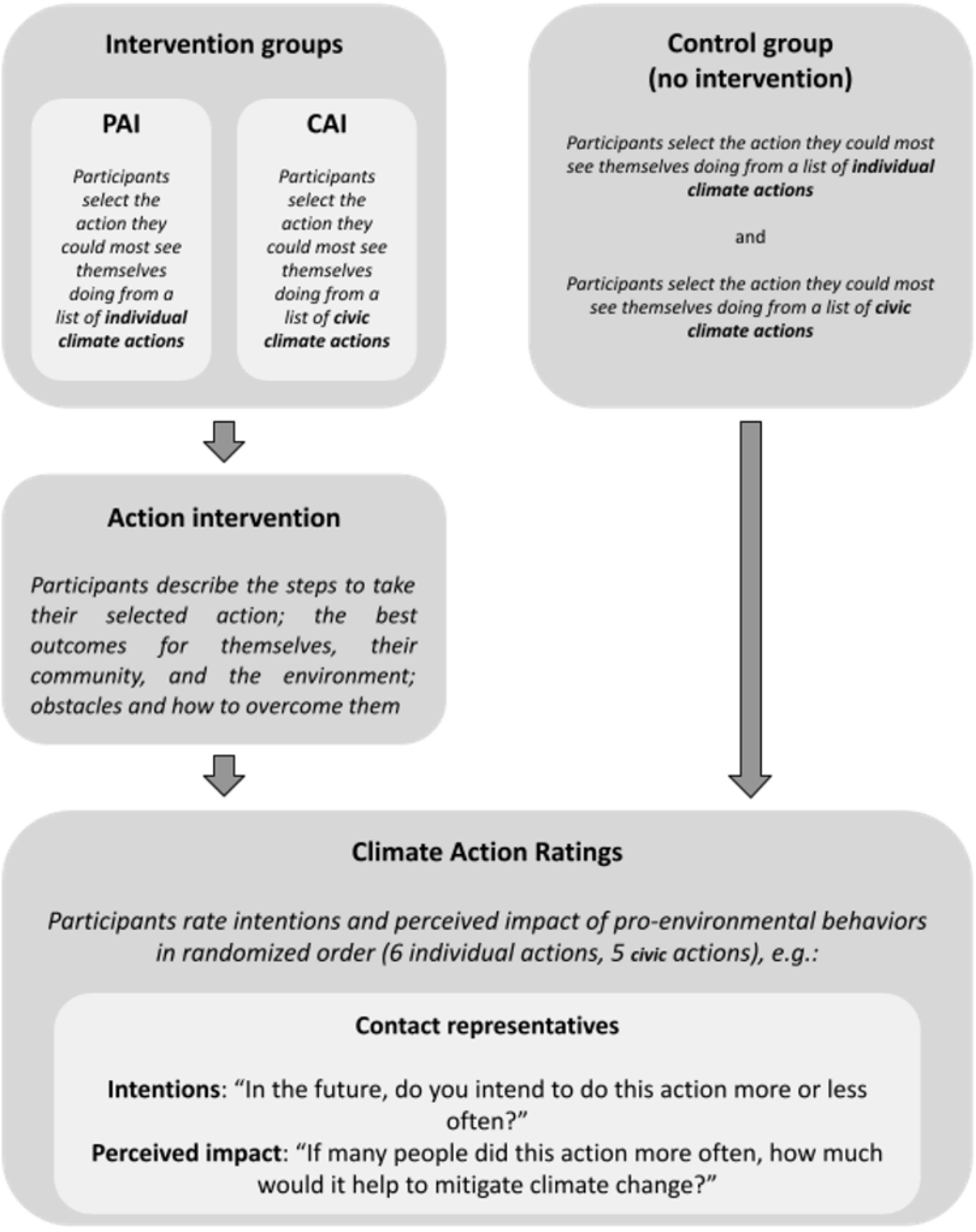


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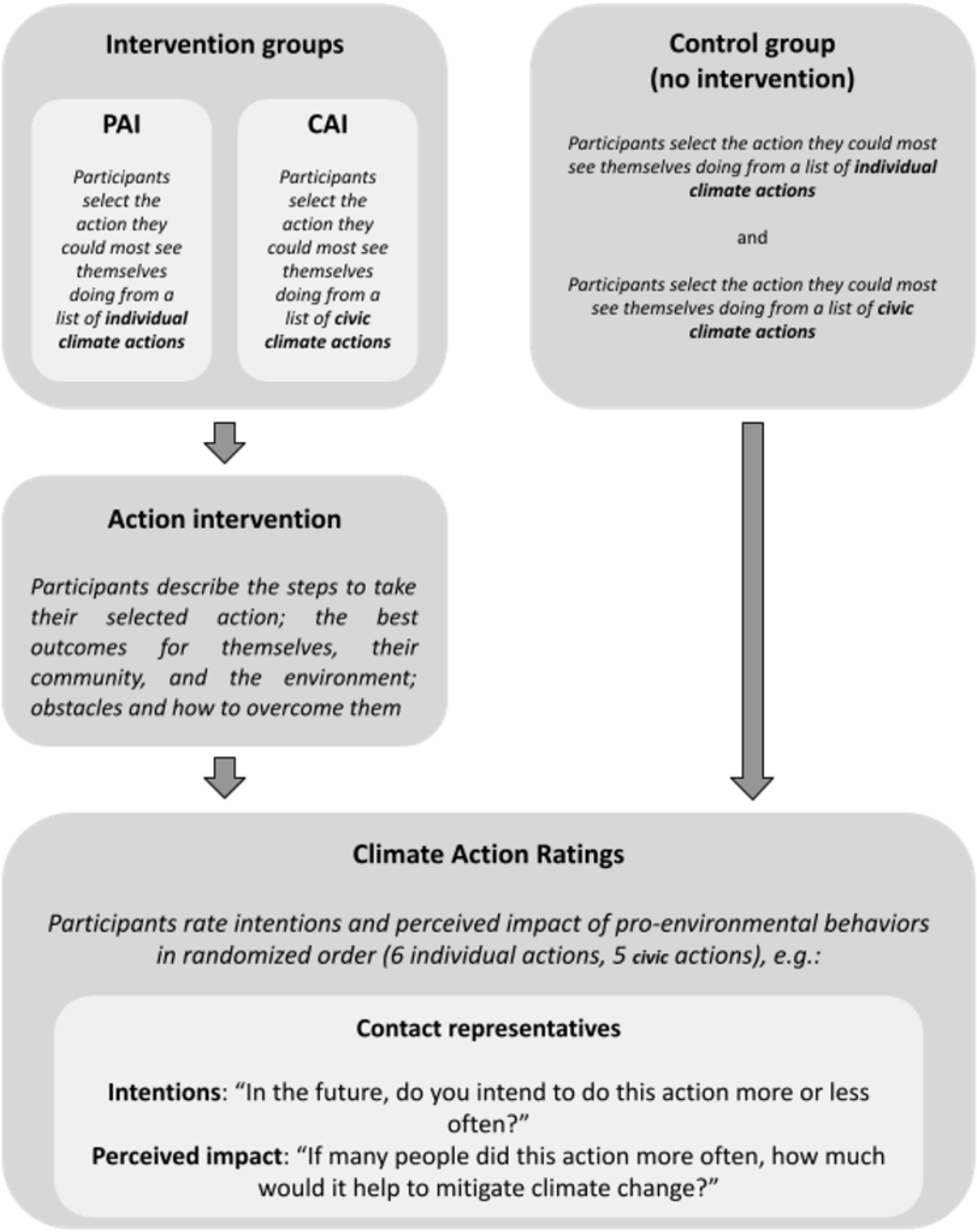


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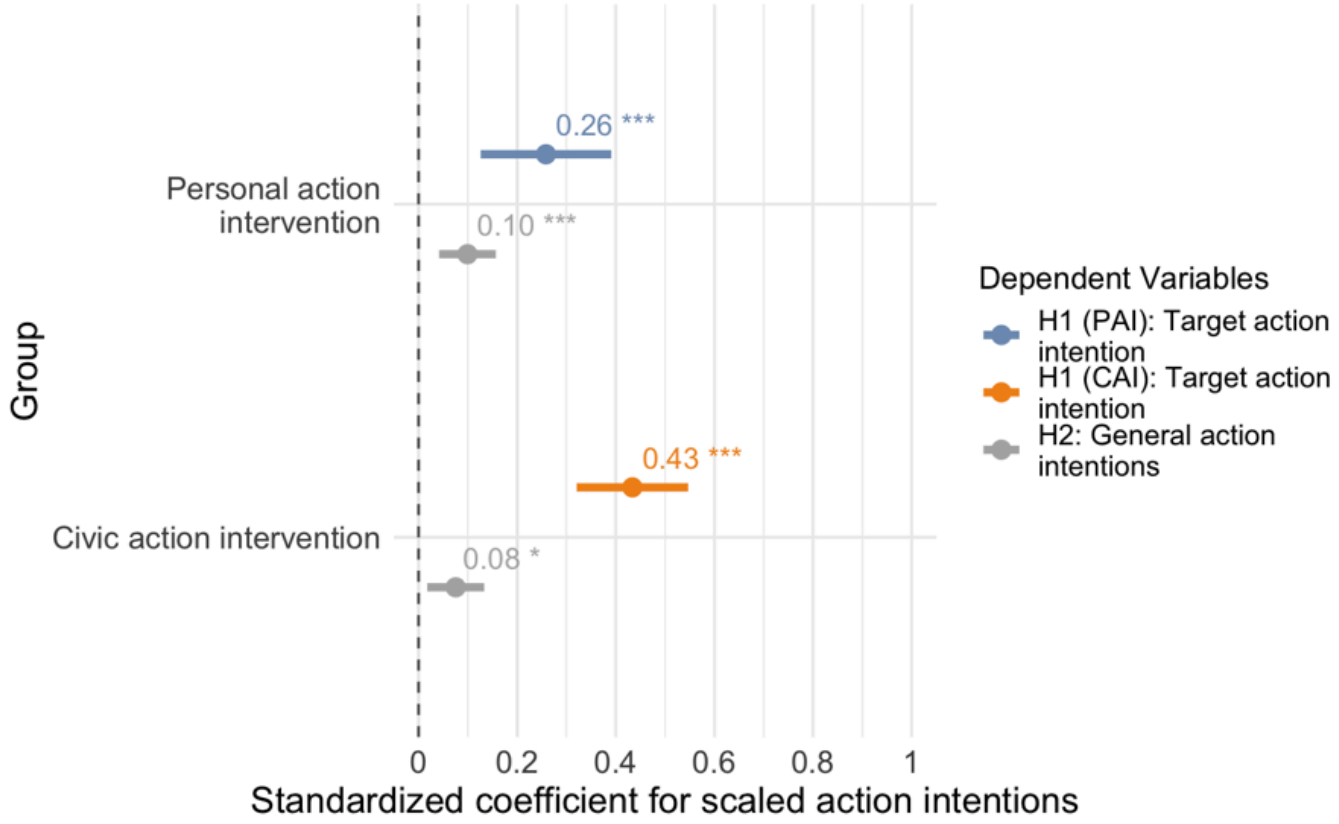


Figure 2

Study 1 intention effects: target action (H1) and general effects (H2)

Note. Personal action intervention (top) and civic action intervention (bottom) as predictor variables for action intentions. Figure shows standardized regression coefficients compared to the control group with 95% CIs. In gold: the target action participants chose (H1). In grey: General pro-environmental intentions across all measured action intentions (H2).

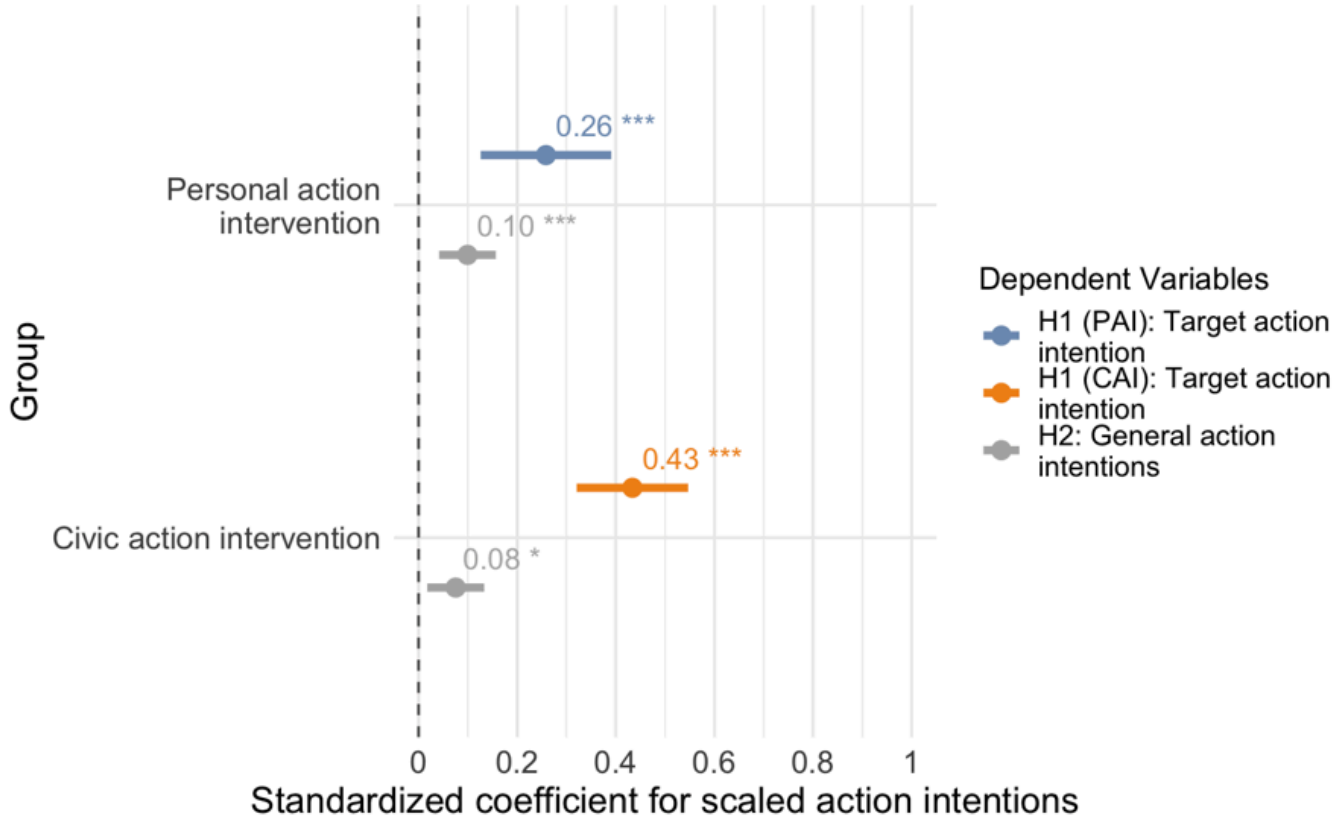


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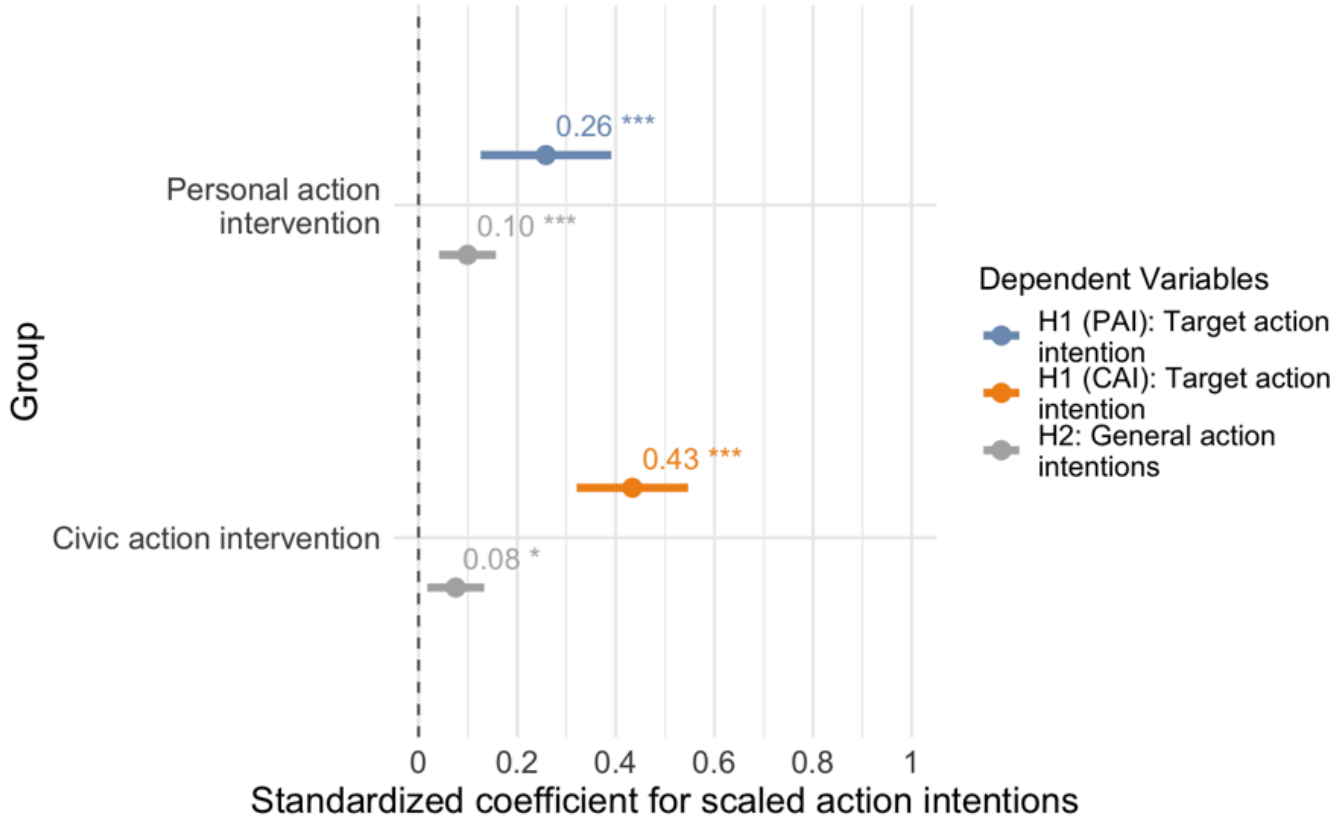


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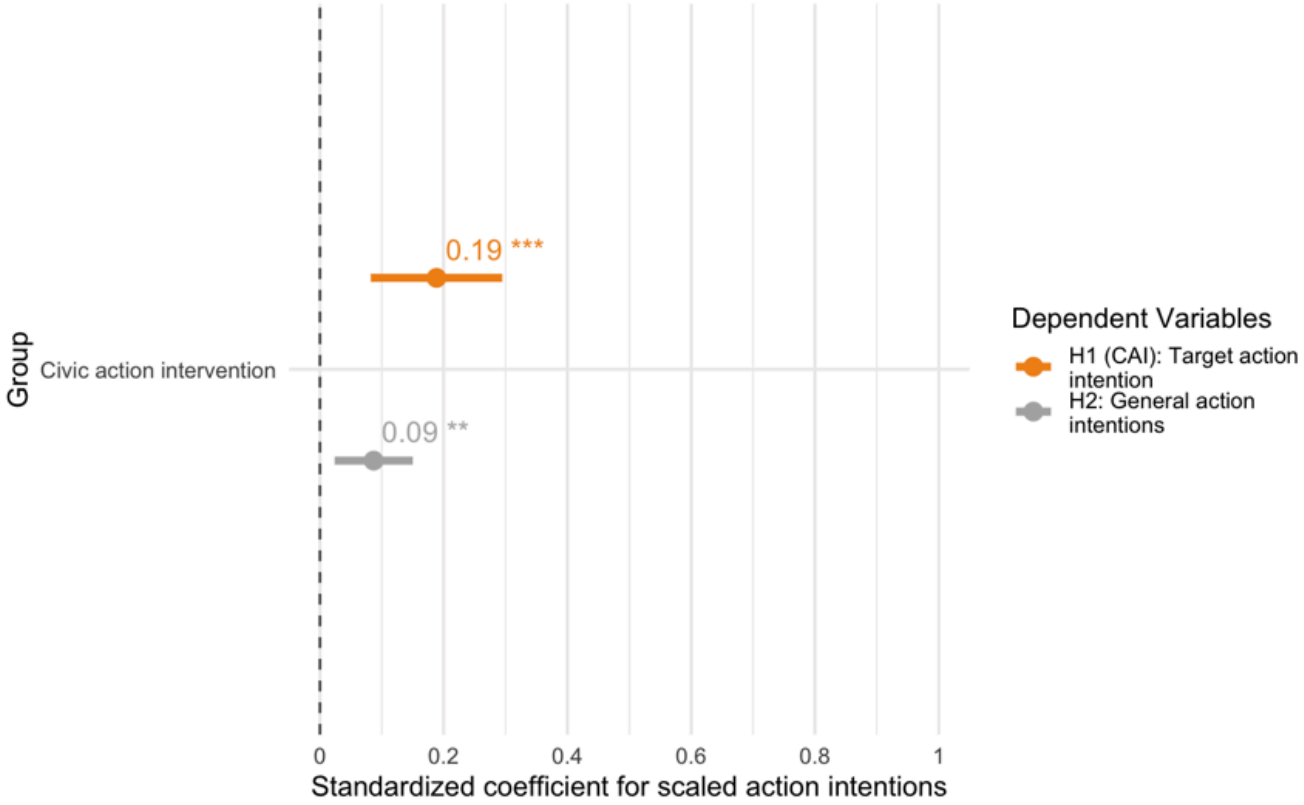


Figure 3

Study 2 intention effects: target action (H1) and general effects (H2)

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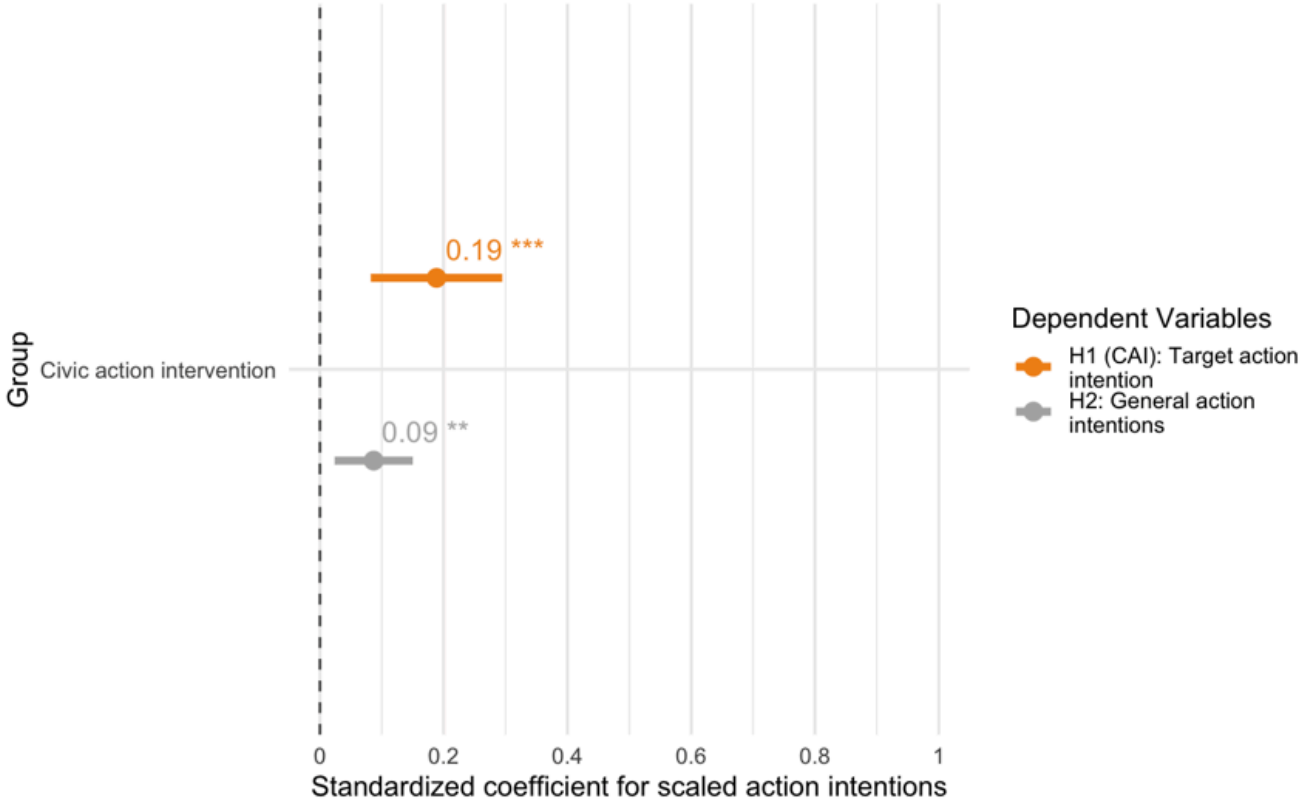


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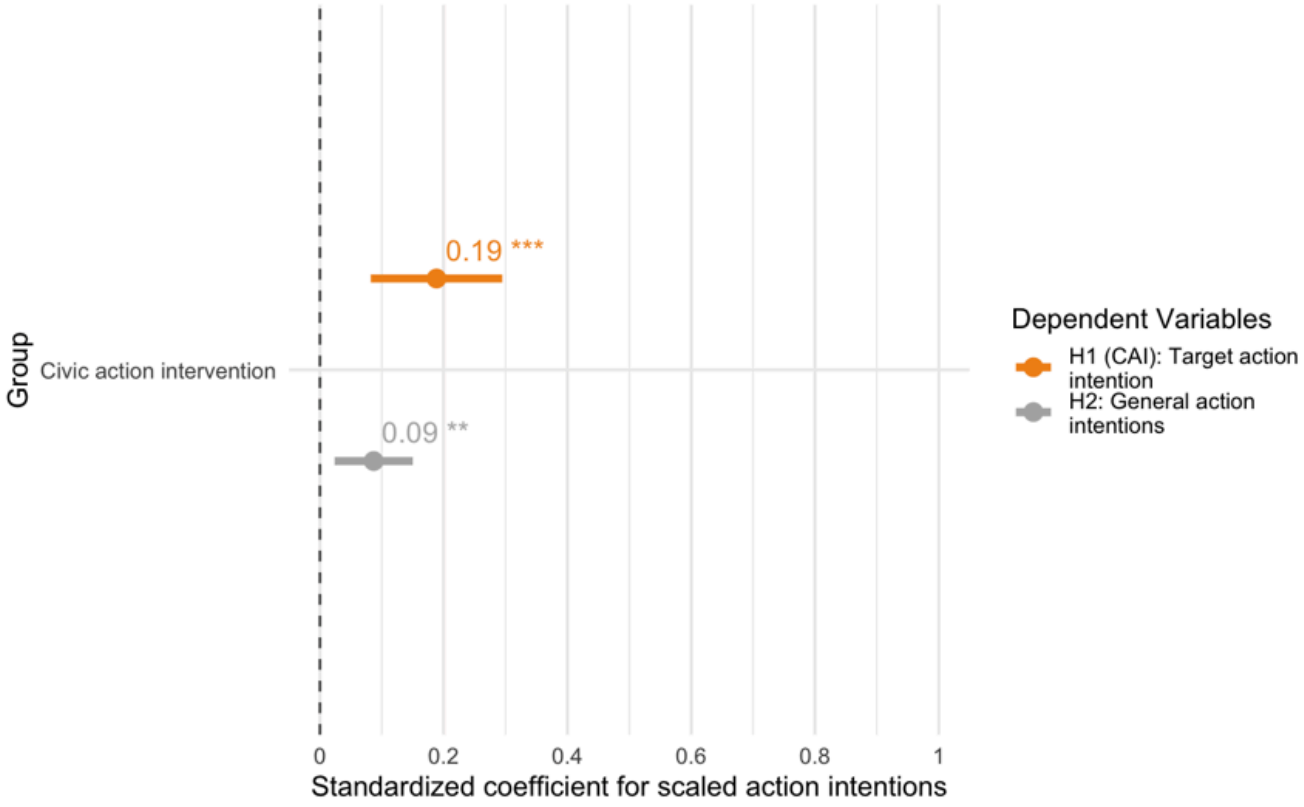


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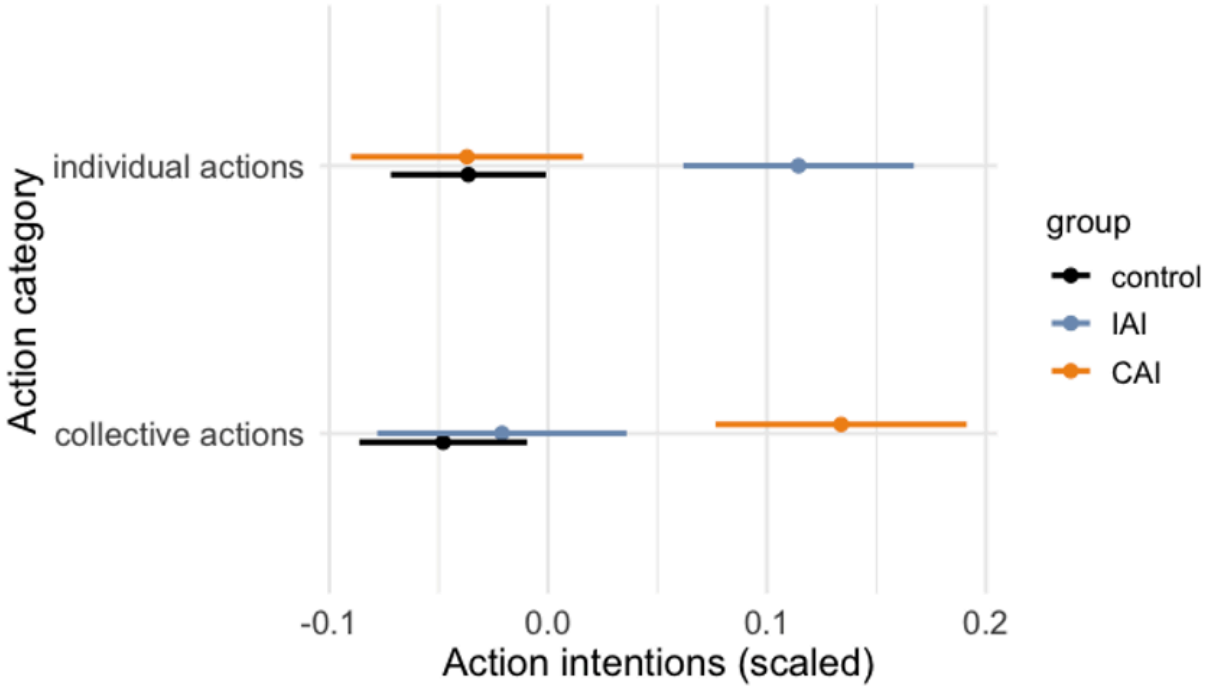


Figure 4

Study 1 intervention effects on action intentions, by action category

Note. Estimated intentions to engage in an action for the civic action intervention group (orange), personal action intervention group (blue), and control group (black), from the mixed effects regression model (H3). Plot shows estimated mean and 95% CIs for action intentions per each condition, per action category (top = personal, bottom = civic).

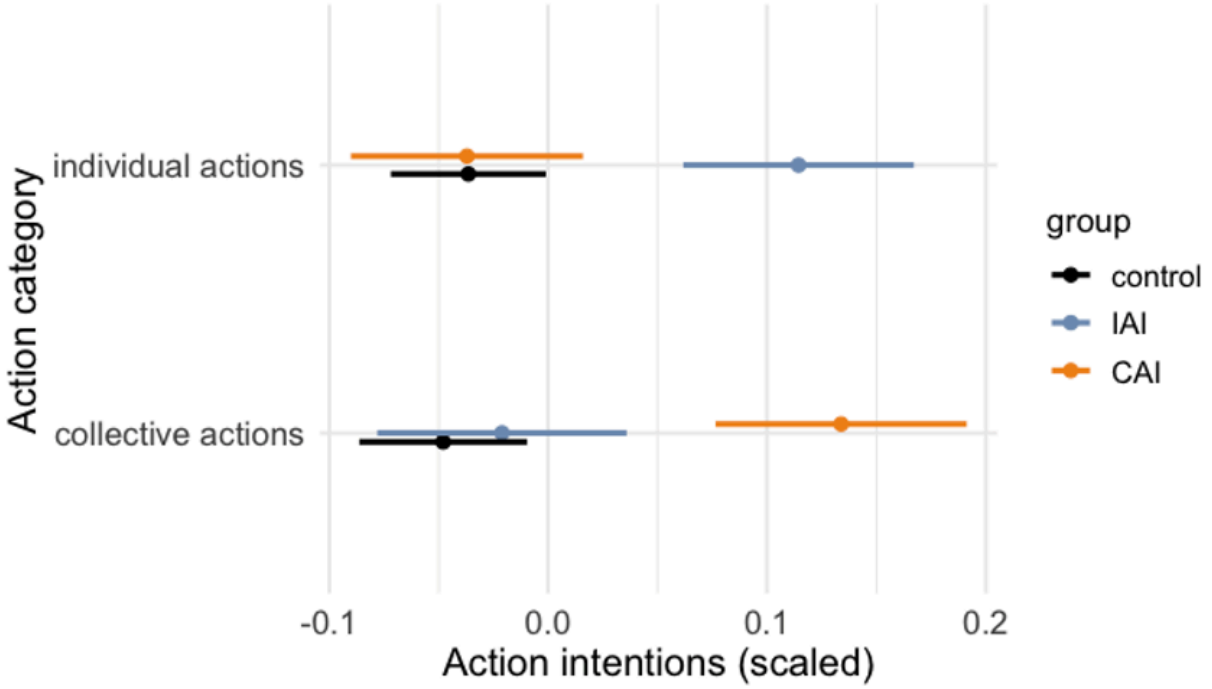


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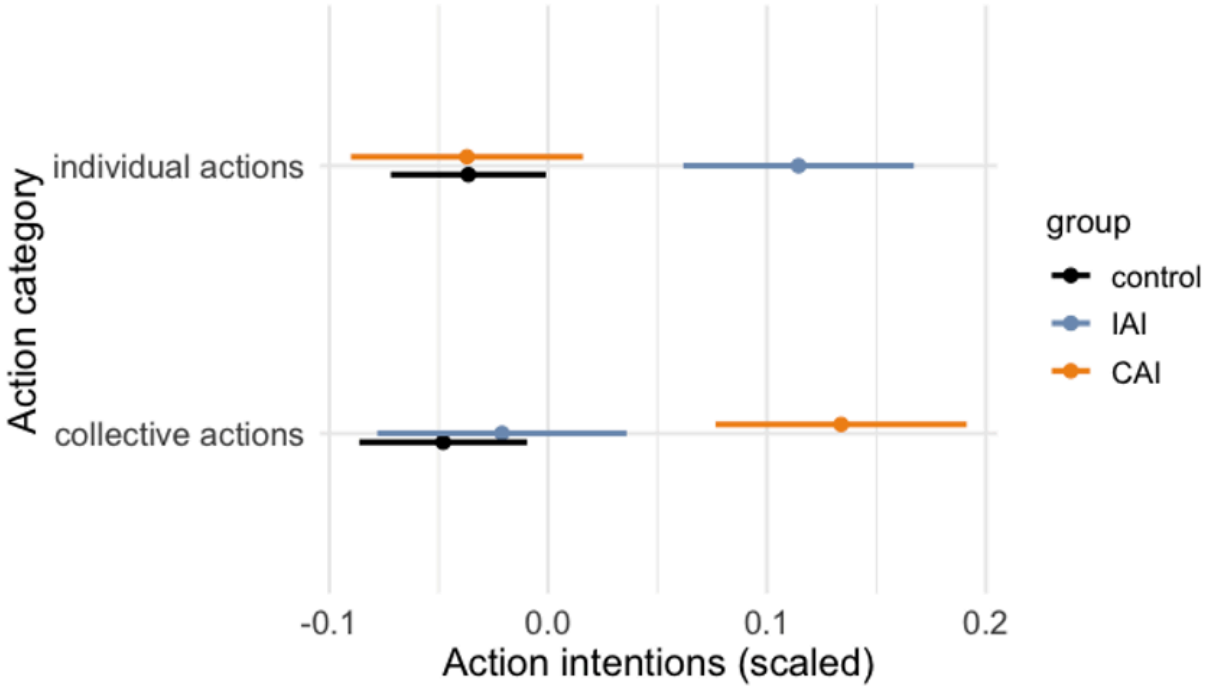


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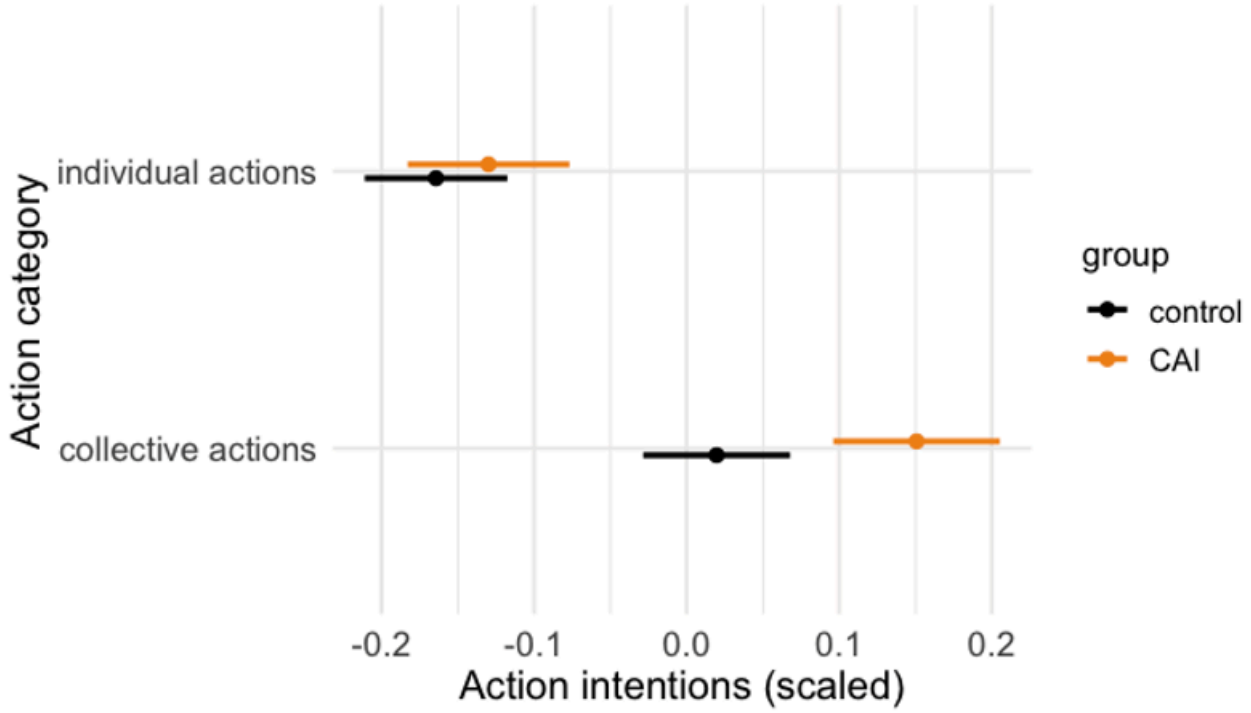


Figure 5

Study 2 intervention effects on action intentions, by action category

Note. Study 2 model-estimated intentions to engage in an action for the civic action intervention group (orange) and control group (black), from the mixed effects regression model. Plot shows estimated mean and 95% CIs for action intentions per each condition, per action category (top = personal, bottom = civic).

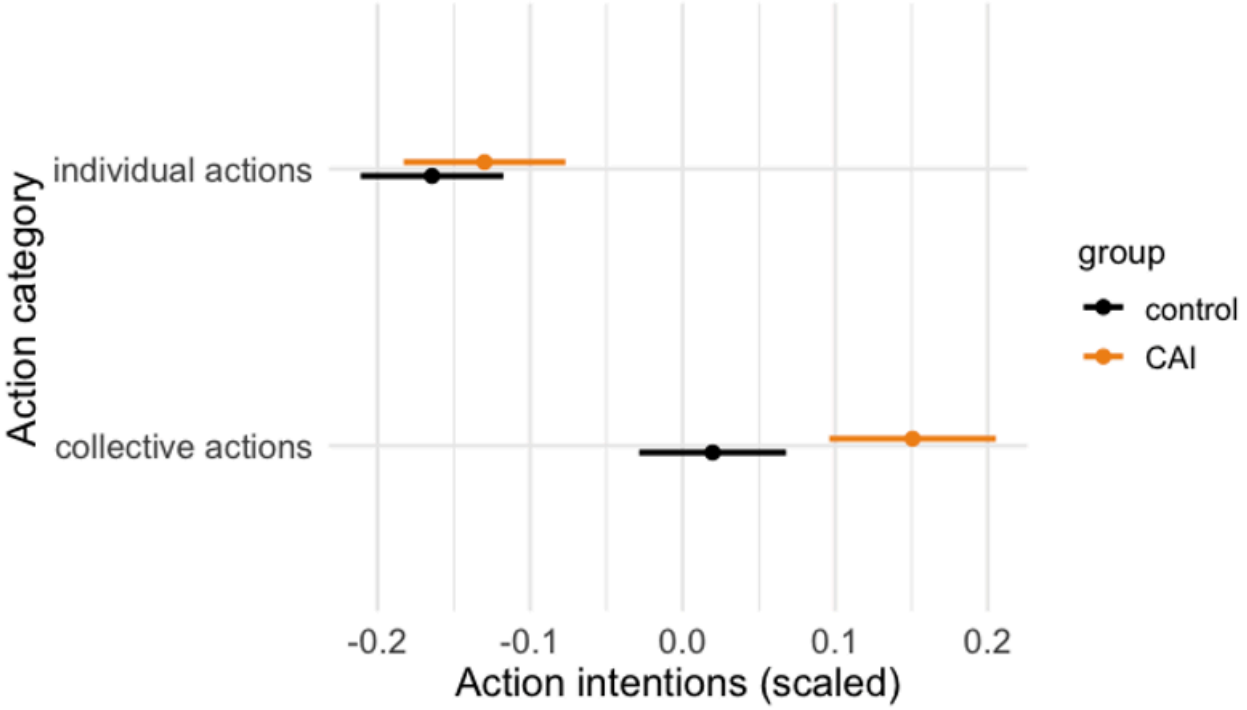


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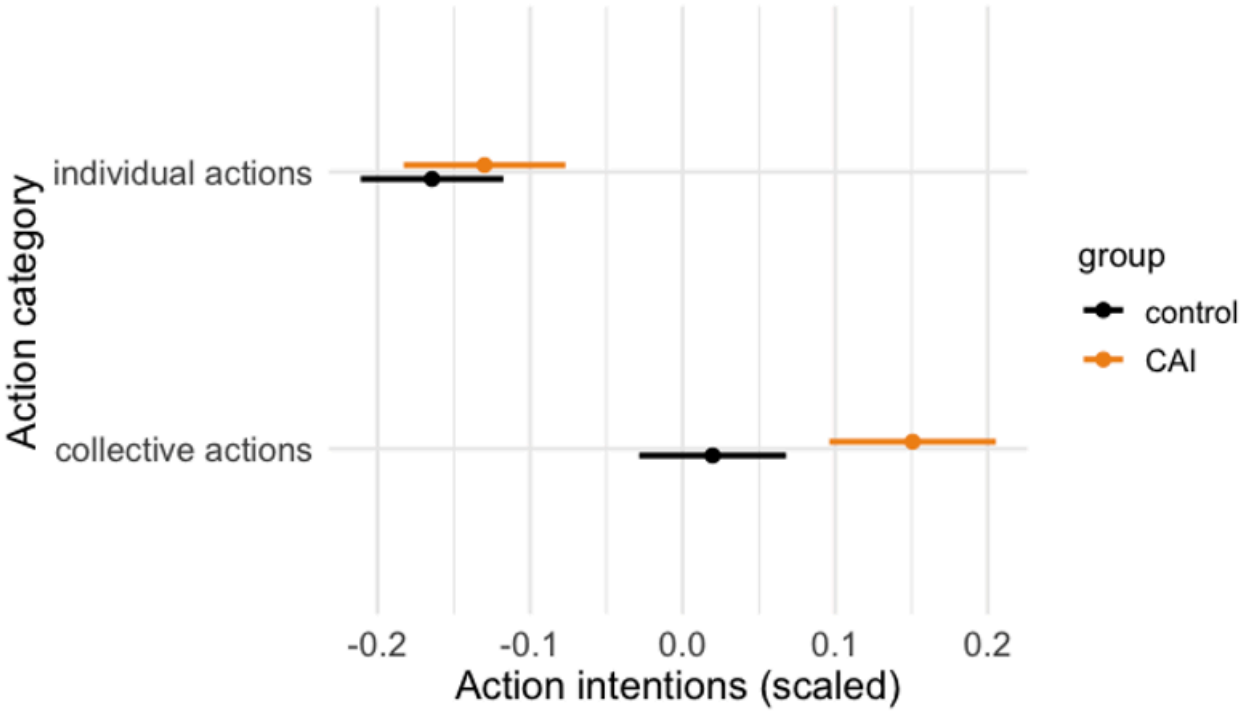


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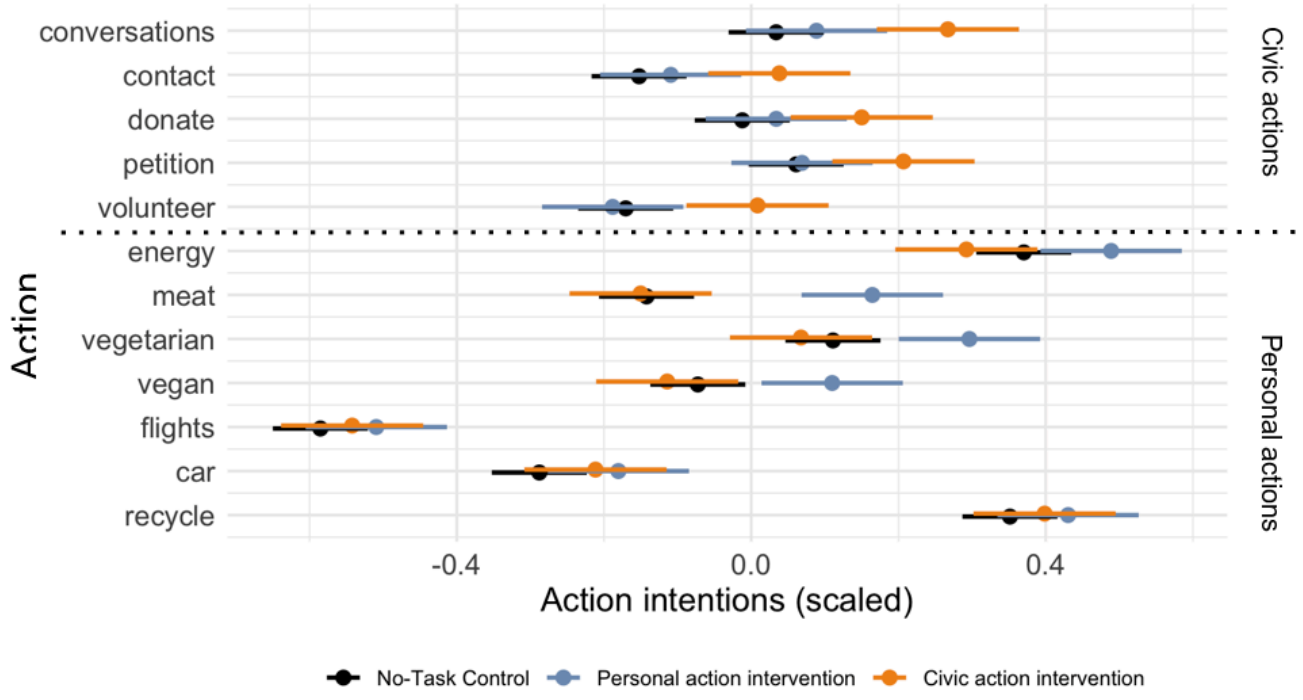


Figure 6

Study 1 intention effects per action

Note. Estimated intentions to engage in an action per each action and per civic action intervention (orange), personal action intervention (blue), and control (black) conditions, from the mixed effects regression model. Plot shows estimated mean and 95% CIs for action intentions per each condition, per each action item. Actions are grouped per civic (top) and personal (bottom) by dotted line.

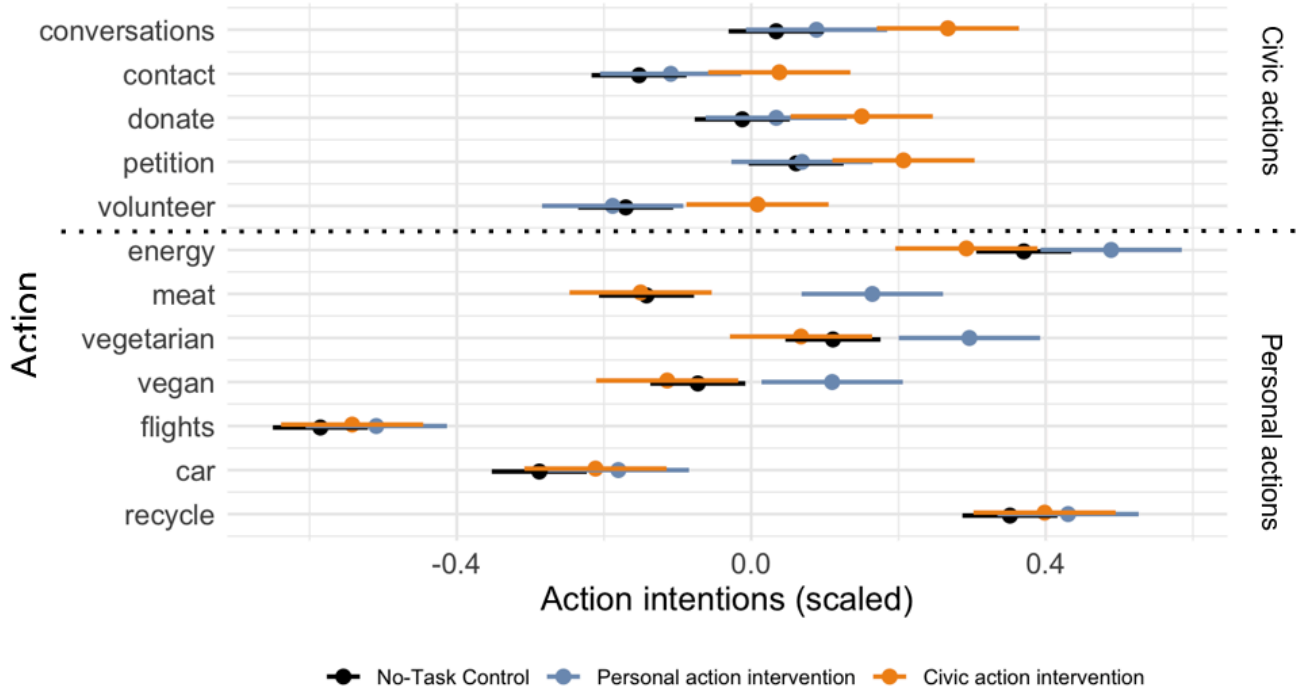


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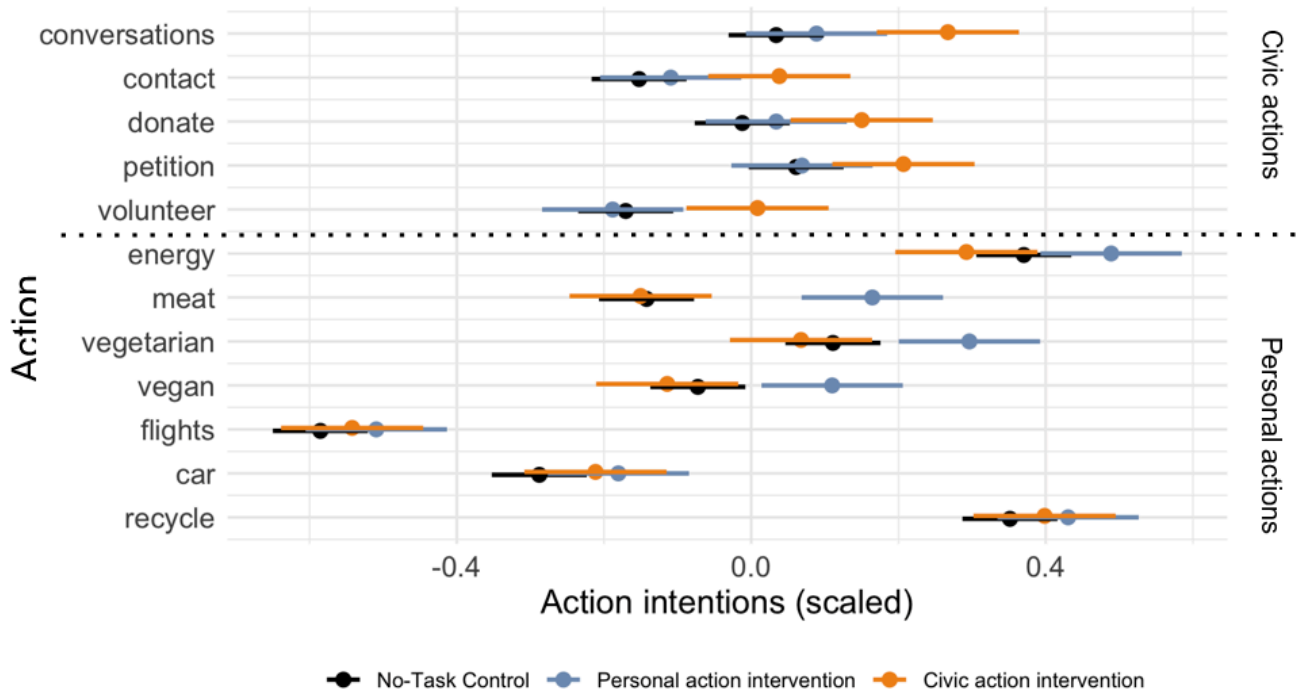


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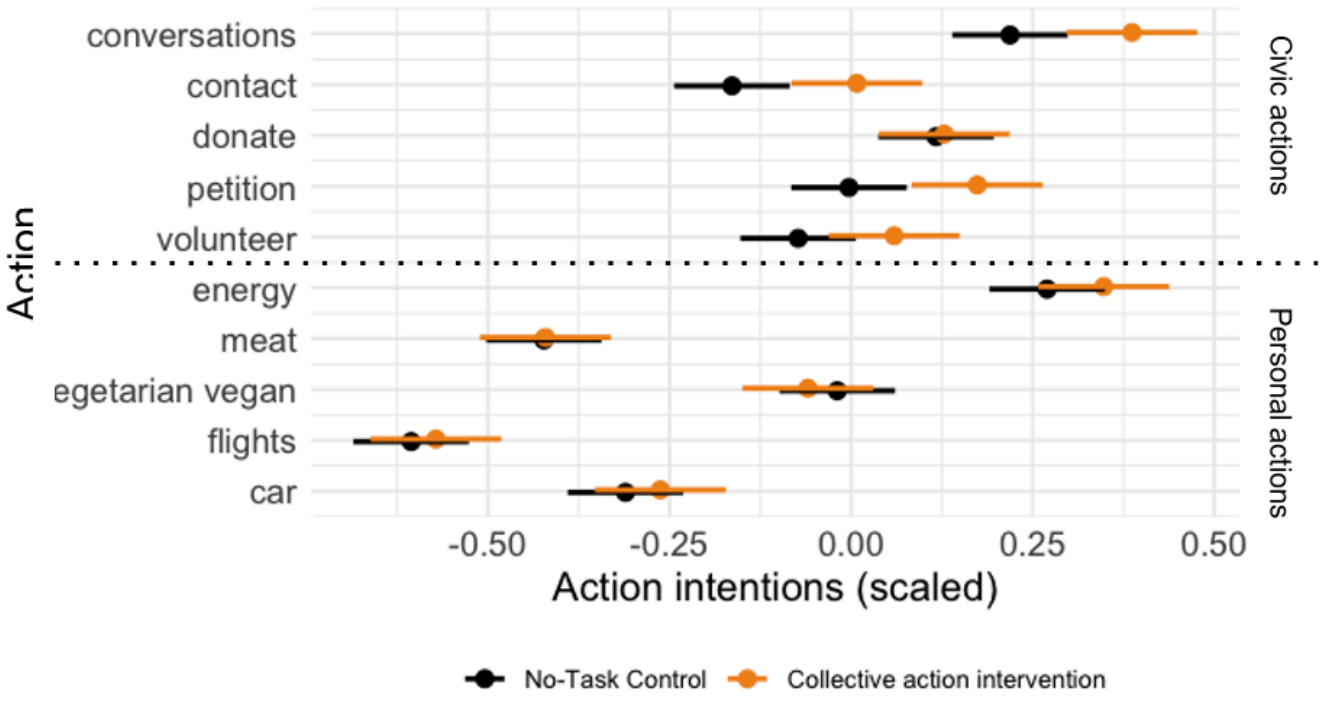


Figure 7

Study 2 intention effects per action

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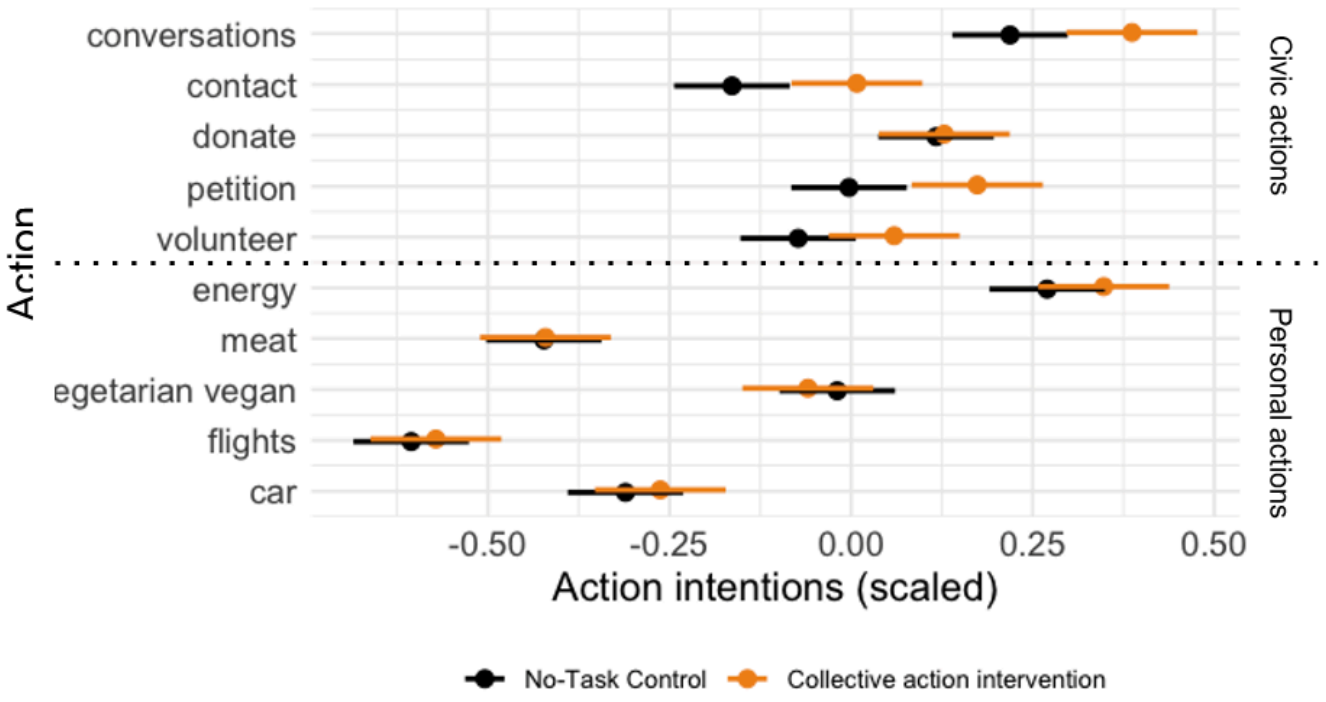


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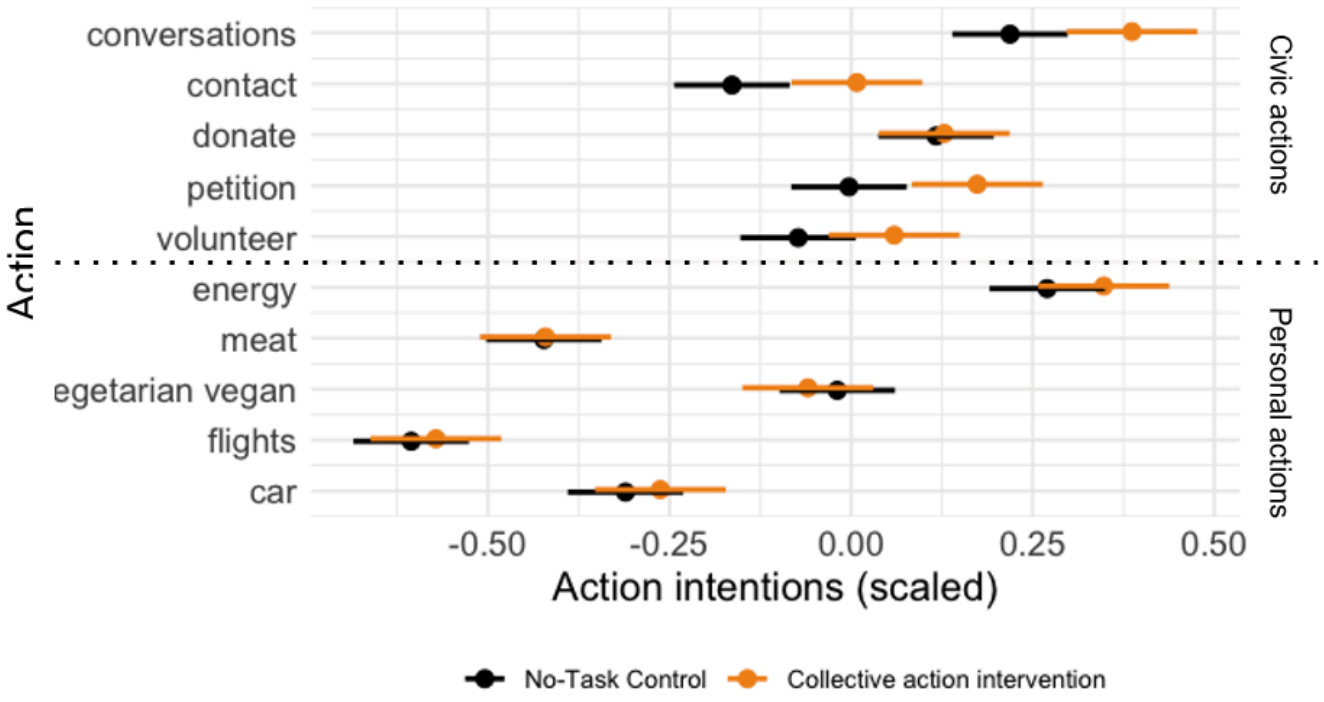


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Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- SM.pdf
- SM.pdf
- SM.pdf