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Can't Hurt, Might Help: Examining the Spillover Effects from Purposefully Adopting a New

Pro-Environmental Behavior

Katherine Lacasse

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Abstract

This field experiment investigated whether purposefully adopting a new pro-environmental behavior (e.g., unplugging appliances, reusing shopping bags) led to positive spillover by altering people's subsequent pro-environmental behaviors and political attitudes. Participants (N = 125) recruited through community organizations were randomly assigned to either adopt a new pro-environmental behavior of their choice for three weeks, or were not invited to do so. Behavior adoption increased participants' likelihood of contacting their Senator about climate change, but had little direct spillover effect on other individual pro-environmental behaviors, their likelihood of making household-wide changes, the political importance they placed on climate-related issues, or their support for emissions-reducing policies. Behavior adoption increased sense of environmental responsibility among some participants, leading to indirect positive effects on purchasing organic/local produce and policy support. Overall, observed positive spillover effects were limited and relatively small. There was little indication that behavior adoption led to any meaningful negative spillover effects.

Keywords: pro-environmental behavior; behavior change; attitudes; spillover; environmental responsibility

Can't Hurt, Might Help: Examining the Spillover Effects from Purposefully Adopting a New

Pro-Environmental Behavior

We all have behaviors that we want to change, whether to quit biting our nails or to be

nicer to that one annoying relative during the holidays. More and more, people are also working

to change their behaviors to become more environmentally-friendly: We try to remember to

bring reusable bags to the store or to cook more vegetarian recipes. There is already a wealth of

research explaining what predicts whether someone will perform a pro-environmental behavior

(PEB), and on the best ways to instigate that behavior change (for meta-analyses, see Bamberg &

Möser, 2007; Osbaldiston & Schott, 2012). One issue that should be examined more closely is if

purposefully adopting a new individual PEB influences people's other behaviors and political

attitudes relevant to the environment. "Purposeful adoption," refers to personally deciding to

start performing a new PEB, and "individual PEB" refers to the type of small PEB in one's life

that needs to be continually enacted, rather than a one-time behavior.

Evidence of Spillover

When examining how the performance of a PEB affects other PEBs, researchers find it

can sometimes lead to "positive spillover" meaning increased performance of subsequent PEBs,

and other times lead to "negative spillover" meaning reduction in performance of subsequent

PEBs (for reviews, see Nilsson, Bergquist, & Schultz, 2017; Thøgersen & Crompton, 2009;

Truelove, Carrico, Weber, Raimi, & Vandenbergh, 2014).

When an intervention induces people to perform a particular PEB such as installing a

low-flow shower head, reusing towels in a hotel room, purchasing environmentally-friendly

products, or bringing reusable bags to the store, researchers often find that this initial PEB

increases the likelihood that people perform subsequent PEBs (Baca-Motes, Brown, Gneezy,

Keenan, & Nelson, 2013; Hutton, 1982; Lanzini & Thøgersen, 2014; Thomas, Poortinga, &

Sautkina, 2016). Other research in which people are reminded of their past PEBs also

demonstrates that this can increase their performance of subsequent PEBs (Cornelissen,

Pandelaere, Warlop, & Dewitte, 2008; van der Werff, Steg, & Keizer, 2013; 2014a).

Correlational research often finds that those who perform more PEBs are also likely to

demonstrate stronger political attitudes about environmental issues in terms of political concern

and support for environmental policies (Stern, Dietz, Abel, Guagnano, & Kalof, 1999; Thøgersen

& Noblet, 2012). For example, consistently boycotting non-environmental products or

purchasing environmentally-friendly products are both related to greater traditional political

engagement and activist behavior (Gotlieb & Wells, 2012; Willis & Schor, 2012). Evidence also

suggests that past PEBs are likely to spill over into stronger political attitudes in certain

conditions, such as if people are directly labeled as "environmentalists" in conjunction with their

past PEB performance (Lacasse, 2016).

There are also relatively fewer examples of an initial PEB leading to subsequent

reduction in other PEBs. A water conservation intervention successfully reduced water use while

simultaneously leading to an uptick in electricity use, although differences between the

intervention and control conditions disappeared after the feedback portion of intervention was

removed (Tiefenbeck, Staake, Roth, & Sachs, 2013). Additionally, a panel study found evidence

that initial PEBs led to some positive and some negative spillover into subsequent PEBs

(Thøgersen & Olander, 2003). Performing a one-time PEB or reminding people of their past

PEBs can also reduce support for environmental policies (Werfel, 2017), particularly in liberals

in certain circumstances (Lacasse, 2015; Truelove, Yeung, Carrico, Gillis, & Raimi, 2016).

Spillover Mechanisms

These disparate findings have been explained by examining the motivations and psychological mechanisms underlying the performance of the initial PEB. For one, people's attributions of the cause of their initial PEB will likely impact spillover (Lacasse, 2013; Thøgersen & Crompton, 2009; Truelove et al., 2014). If the initial PEB is perceived to be externally-motivated (i.e., due to an external reward or social pressure), it may interrupt intrinsic motivation and therefore reduce the likelihood of other PEBs or changes in one's environmental political attitudes. Alternately, when people perceive the initial PEB is internally-motivated, it may boost aspects of intrinsic motivation and increase likelihood of further PEBs. If the behavior is performed for internal, non-environmental reasons (e.g., to save money, to improve health), spillover to other PEBs or environmental political attitudes is not expected because the initial behavior was not connected to the environment. Several studies have found that these motivations are important for spillover to occur (Carrico, Raimi, Truelove, & Eby, 2017; Steinhorst, Klöckner, & Matthies, 2015; Steinhorst & Matthies, 2016), although others found some evidence of positive spillover even with external incentives (Lanzini & Thøgersen, 2014).

In terms of psychological mechanisms, theoretically negative spillover is likely when the initial PEB was performed to alleviate some negative affect, such as guilt due to harming the environment or fear of environmental disaster (Truelove et al., 2014). Once the PEB is performed, the negative feeling will subside and further PEBs or strong environmental political attitudes are less likely since the affective motivation for helping the environment is removed. Positive spillover is theoretically more likely when performance of the first PEB is role-based, such as to live up to a goal or obligation, or to maintain one's status as a self-identified environmentally-concerned person (Lacasse, 2013; Thøgersen & Crompton, 2009; Truelove et al., 2014). In terms of goals and obligations, performing one PEB can alter people's cognitive

evaluations of their ability and their obligation to take action on environmental problems, making stronger political attitudes and future PEBs more likely. In terms of self-oriented processes, performing one PEB can alter how people view themselves and strengthen their environmental convictions, leading them to display stronger political attitudes and further PEBs.

For these reasons, purposeful adoption of a PEB is a scenario in which positive spillover is more likely than negative spillover. Purposeful adoption is generally internally-motivated, stemming from a personal desire to become more environmentally-friendly. Negative affect could potentially be a motivator, but since purposeful adoption requires repeated performance of the PEB, it is more likely a role-based decision. The question then remains: What is the role-based mechanism that leads to this positive spillover?

Environmental responsibility. Theories of altruistic behavior such as norm-activation theory (Schwartz, 1973) and its later expansion value-belief-norm theory (Stern et al., 1999) have commonly been applied to PEBs. These theories focus on people's cognitive beliefs, positing that altruistic behaviors occur when someone's personal norm is activated. The personal norm activation is due to some combination of belief that something of importance is being harmed (awareness of consequences) and belief that he/she has the ability to take meaningful action to avert that harm (ascription of responsibility). Although these beliefs and norms are each often treated as separate constructs, they overlap quite a bit and are not necessarily interpreted as unique or separate ideas among the general public. Researchers themselves have used the multiple terms such as "personal norm," "moral obligation," and "obligation-based intrinsic motivation" to refer to very similar constructs (Barbarossa & De Pelsmacker, 2016; Harland, Staats, & Wilke, 1999; van der Werff et al., 2013). Additionally, a study of the predictors of environmental behavior that measured both the belief in one's ability to effectively address

environmental problems and personal norms to perform PEBs found that this belief was very

closely linked to personal norms, and both factors led to greater PEBs (Harland, Staats, & Wilke,

2007). Therefore, this set of cognitive evaluation processes including belief in one's ability and

obligation to help the planet will be referred to as "environmental responsibility" and will be

measured as a single construct as a potential spillover mechanism.

In terms of spillover, the initial PEB can boost one's environmental responsibility, which

then can positively spill over into future PEBs and political attitudes. Indeed, some PEB spillover

research has found that environmental responsibility mediates positive spillover from one PEB to

another (Steinhorst et al., 2015; van der Werff et al., 2013). For example, an intervention aimed

at increasing electricity conservation intentions also led to a boost in environmental

responsibility, which in turn led to greater intentions to perform individual PEBs such as eating

less meat as well as political PEBs such as signing a climate protection petition (Steinhorst et al.,

2015).

Environmental centrality. Alternately, processes related to the self and to the personal

environmental convictions such as environmental identity and attitude strength have also been

applied to spillover between PEBs. People aim to maintain a positive view of themselves, and

when environmental concerns are central to their identity or they hold strong environmental

attitudes, they will likely remain consistent and act in multiple ways to help the environment.

Self-perception theory suggests that performing a new behavior can alter the way we see

ourselves, and this new self-perception (e.g., boost in environmental identity) is likely to

influence future behaviors (Bem, 1972; Truelove et al., 2014). Similarly, there are many

interrelated dimensions to attitude strength, including several elements related to attitude

centrality such as how personally important the attitude is and how representative the attitude is

of one's personal values (Holland, Verplanken, & Knippenberg, 2002; Krosnick, Boninger, Chuang, Berent, & Carnot, 1993). Outwardly performing behaviors that demonstrate one's personal commitment to a cause can strengthen attitudes towards the cause itself (Holland et al., 2002). Since strong attitudes largely stem from sense of self, attitude strength overlaps with environmental identity. Indeed, items used to measure environmental identity often ask about people's self-concept (e.g., Poortinga, Whitmarsh, & Suffolk, 2013), but also often include items relevant to attitude strength such as the importance of environmental behaviors to the self (e.g., van der Werff, Steg, & Keizer, 2014b). Therefore, this set of similar self-oriented processes including environmental identity and attitude strength will be referred to as "environmental centrality" and will be measured as a single construct as a potential spillover mechanism.

Research indicates that performing PEBs often increases one's environmental centrality (Poortinga et al., 2013; van der Werff, Steg, & Keizer, 2014a; 2014b). Additionally, environmental centrality is a predictor of consistency across PEBs (Gatersleben, Murtagh, & Abrahamse, 2014; Whitmarsh & O'Neill, 2010) and links individual PEBs to political attitudes such as support for environmental policies (Lacasse, 2015; 2016). Therefore, strong environmental centrality should feed into consistency processes that lead to positive spillover.

Environmental responsibility and environmental centrality processes represent different types of mechanisms, but they are somewhat related. For example, one study found that strengthening one's environmental identity can also heighten one's sense of responsibility and thereby lead to more PEBs (van der Werff et al., 2013). This research indicates that environmental responsibility is a more proximal predictor of PEBs than is environmental centrality, but the mechanisms are likely to both work simultaneously.

Current Research

The goal of the present study was to examine how purposefully adopting a new PEB can spill over into a wide range of other PEBs and political attitudes. The focus on purposeful adoption differs from past spillover research, which largely focused on the spillover effects from a behavior intervention aimed at changing a particular PEB chosen by the researchers (Baca-Motes et al., 2013; Carrico et al., 2017; Hutton, 1982; Lanzini & Thøgersen, 2014; Margetts & Kashima, 2017; Steinhorst & Matthies, 2016; Thomas et al., 2016; Tiefenbeck et al., 2013; Truelove et al., 2016) and from interventions that reminded people of their past PEBs (Cornelissen, Pandelaere, Warlop, & Dewitte, 2008; Lacasse, 2015; 2016; van der Werff et al., 2013; 2014a). In this study, participants purposefully adopted a new PEB of their choice to examine how this more internally-motivated and repeatedly performed action impacted their subsequent PEBs and political attitudes. Rather than manipulating PEBs in the lab or asking participants to reflect upon their past PEBs, this field experiment had participants integrate the new PEB into their daily lives for three weeks. Another strength is that this study measured change in participants' PEBs and political attitudes through employing pretest and posttest questionnaires, a more precise way of measuring spillover than simply comparing experimental conditions on posttest scores. Finally, the study included two distinct methods of tracking participants' PEB adoption: message response tracking and self-report calendar tracking. Although neither tracking method was intended to influence participants, the two conditions were created as a check, just in case method of tracking differentially impacted outcomes.

This study measured a wide range of PEBs (individual PEBs that are performed repeatedly, household PEBs that involve making a one-time change with lasting benefits, political behaviors to support climate-related issues) and political attitudes (importance of climate-related issues in politics, support for emissions-reducing policies) to examine the range

of areas where spillover could occur, with a specific focus on politically-oriented behaviors and attitudes that are less frequently included in spillover research. Political behaviors and attitudes are particularly important since collective political actions and policy changes are a necessary piece to address large-scale environmental issues such as climate change. The study also examined two possible mechanisms through which adopting a PEB might lead to spillover. Specifically, it investigated if adopting a new PEB influenced people's sense of environmental responsibility and/or environmental centrality and if these in turn explained subsequent changes in PEBs and political attitudes. Therefore, the following two hypotheses were tested:

H1: Purposefully adopting a new PEB will lead to an increase in PEBs and strengthen political attitudes as compared to a control condition in which participants are not invited to adopt a new PEB.

H2: These positive spillover effects will be mediated by increased environmental responsibility and by increased environmental centrality.

Method

Outline of Research Design

This was a mixed between-and-within-subjects experimental design (see Figure 1). All participants first completed a pretest questionnaire, followed by the experimental manipulation. Participants were randomly assigned to (1) the control condition, (2) behavior adoption with message response tracking (BAM condition), or (3) behavior adoption with self-report calendar tracking (BAC condition). The manipulation asked participants in BAM or BAC conditions to adopt a new PEB for a three-week span, and those in the control condition were not invited to actively adopt a new behavior. At the end of the three-week span, all participants completed a posttest questionnaire.

Participants

Adult residents of central Massachusetts were recruited through various social organizations such as hobby clubs, civic organizations, and recreational sports teams. To help avoid selection-bias towards environmentally concerned individuals, it was advertised as a study on political attitudes and daily behaviors. Participants volunteered in return for a $5 donation to their organization. One hundred and sixty-five participants completed the pretest questionnaire, 147 participated in the experimental manipulation, and 141 completed the posttest questionnaire.

Additionally, nine participants from behavior adoption conditions reported performing their adopted PEB less than 50% of the time. Since behavior adoption was the variable of interest manipulated by the experimental conditions, these participants were removed from further analysis. After participant dropout and removal, those who reported that climate change was likely or very likely *not* occurring were not equally spread across conditions, leaving only one such participant in a behavior adoption condition and six in the control condition. To ensure that all conditions were similar in climate change belief, these seven participants were removed from further analysis, limiting the dataset to those who indicated that climate change was likely or very likely occurring. The final dataset included 125 participants: 39 in the control condition, 45 in the BAM condition, and 41 in the BAC condition.

Demographic information was collected on the pretest questionnaire, including gender, age, political party, education on a range from 1 (junior high school) to 8 (doctoral, law, or medical degree), and political orientation by asking participants, "How would you describe your political orientation?" on a range from 1 (Extremely liberal) to 7 (Extremely conservative; Lacasse, 2015). Of the remaining 125 participants, 59% were male and 41% female, ranging from ages 22-84 ($M = 54.86$, $SD = 13.73$). Most of the participants were White (97%) and highly

educated ($M = 7.08$, $SD = 1.24$). Forty-four percent were Democrats, 21% were Republicans, and 35% had no political party, and the sample was somewhat liberal-leaning ($M = 3.43$, $SD = 1.68$). The participants who dropped out or were removed did not significantly differ from the remaining participants in gender, race, or educational attainment, $ps \geq .24$. However, those who dropped out or were removed were significantly younger [$M = 49.18$, $SD = 15.39$; $t(161) = 2.19$, $p = .03$]. They also significantly differed in political party, and specifically were less likely to be Democrats and more likely to be Republicans [28% Democrats; 43% Republicans, 30% no political party; $\chi^2 (2, N = 165) = 7.78$, $p = .020$]. They were also marginally significantly more politically conservative [$M = 4.05$, $SD = 1.84$; $t(157) = 1.98$, $p = .05$]. These differences impact interpretation of the study's findings by limiting their generalizability.

Prettest and Posttest Questionnaires

The measures listed below were all included on both the pretest and posttest questionnaires unless otherwise indicated. These measures are a subset from a larger study about changes in environmental values, attitudes, and behaviors. The individual items for each scale are listed on Table 1A in the supplementary materials, and all means and standard deviations for measures are listed on Table 2. All measures were created by the author unless otherwise cited.

PEB and political attitude spillover measures.

Individual PEBs. This measure presented 12 individual PEBs, and only included PEBs that could be regularly performed at least several times per week. Participants rated how often they performed each on a scale: 1 (Almost never), 2 (Rarely), 3 (Sometimes), 4 (Often), and 5 (Almost always). There is imprecision with these kinds of frequency word-anchors, and word-anchors such as "once a day" or "once a month" offer more precise measurements (Newstead & Collis, 1987). However, the PEBs on the measure vary greatly in how many times per day the

opportunity to perform them arises (e.g., opportunities to turn off the lights may arise 20 times

per day, whereas opportunities to take 10-minute showers arise approximately once per day).

Therefore, rather than asking participants to report the actual number of times per day they

performed the PEB (which would widely vary across items), these word-anchors were chosen

because they allow participants to think about how often they performed a PEB when they had

the opportunity, providing a response that would be more comparable across items.

However, the 12 PEBs did not create a reliable scale. Instead, each item was analyzed

individually. Since many BAM and BAC participants chose one of the PEBs on this measure to

adopt for the three-week span (e.g., turn off the lights, take 10-minute showers), their scores for

this behavior would be expected to increase due to their adoption of the behavior, not due to

spillover. To avoid artificially inflating the posttest spillover scores, all BAM and BAC

participants who adopted a particular behavior were removed before analysis on that behavior

was conducted (e.g., those who adopted "turning off the lights" were removed from the analysis

of spillover on the "turning off the lights" individual PEB item).

Household PEBs. This scale presented six household-level PEBs and included behaviors

that required a one-time action or purchase that would help reduce emissions continuously. Since

there was only a small chance that participants would make a large purchase or change to their

home in the three-week span of the study, *likelihood* of making household changes was

measured instead. Participants rated how likely they were to perform each PEB in the next five

years on a scale from 1 (Very unlikely) to 7 (Very likely) with an option to indicate if they had

already completed the PEB in the past five years. Many participants indicated that they had

already performed three of the PEBs: (1) had an energy audit, (2) installed an item to make their

home more energy efficient, and (3) purchased a product to reduce water usage in their home.

Therefore, these three items were analyzed individually. The other three items were averaged to

make a scale, pretest $\alpha = .76$, posttest $\alpha = .72$.

Political behaviors. This scale listed five political PEBs that could be taken to address

the issue of climate change. Participants indicated if they had performed the PEB at all in the last

5 years with either a "yes" or "no." Very few participants indicated that they had "Participated in

a protest, rally, or other kind of public demonstration about climate change," and so this item did

not contribute to the reliability of the scale. The scale was made by averaging the scores of the

other four items (reliability was tested using Kuder-Richardson 20, a special case of Cronbach's

alpha for binary data: pretest $\alpha = .61$, posttest $\alpha = .69$).

Contacting their senator. A measure of actual political behavior was included at the end

of the study. Participants in all conditions were mailed a thank you note from the researcher,

along with a postcard with the typed message, "This year, please vote for policies and laws

which will help slow climate change." In the thank you note, participants were instructed that

they could use the postcard to contact their Senator about climate change if they wished. They

could fill-in a Senator to which they wanted to mail the postcard, sign their name, and were also

given space to write an optional note to the Senator. The postcards were addressed to the

researcher, and it was explained that all postcards would be collected by the researcher and

mailed as a package to the appropriate Senator. Whether or not participants mailed the postcard

served as a measure of political behavior.

Importance of climate-related issues. Political attitudes were first measured with a

political issue rating measure (adapted from Lacasse, 2015). Participants rated 10 different issues

on how important each was for the U.S. government to be currently addressing on a scale from 1

(Opposed to the issue) to 7 (Extremely important). They were specifically asked to vary the

scores on different items so as to reduce the likelihood of ceiling effects. Two items were

averaged to make the climate-related issues scale: "Dealing with climate change" and

"Protecting the environment," pretest $r = .66$, posttest $r = .70$.

   Policy support. Political attitudes were also measured with a policy support measure

(adapted from Leiserowitz, Maibach, Roser-Renouf, & Smith, 2011). Participants received brief

explanations of seven different policies suggested to help reduce greenhouse gas emissions. Each

emissions-reducing policy was rated on a scale from 1 (Strongly oppose) to 5 (Strongly support),

and the seven items were averaged to make a scale, pretest $\alpha = .80$, posttest $\alpha = .78$.

   Spillover mechanism measures.

   Environmental responsibility. Participants' sense of environmental responsibility

included four items about their perceived moral obligation to take action to address climate

change and their ability to make a difference. Participants responded to items on a scale from 1

(Strongly disagree) to 7 (Strongly agree), and responses were averaged to make a scale, pretest α

$= .82$, posttest $\alpha = .89$.

   Environmental centrality. Participants' sense of environmental centrality included seven

items about personal identification with environmental and climate change issues. Some items

were adapted from an attitude strength centrality measure (Holland et al., 2002) with additional

identity items added. Participants responded to items on a scale from 1 (Strongly disagree) to 7

(Strongly agree), and responses were averaged to make a scale, pretest $\alpha = .89$, posttest $\alpha = .92$.

   Factor analysis check: To ensure the discriminant validity of the two spillover

mechanism measures, an exploratory factor analysis was conducted including all 11 items from

the two measures. A principal-axis factor analysis was conducted with promax rotation with

Kaiser normalization. When using the criterion of eigenvalues greater than 1, two factors

accounted for 56% of the total variance in the items. Items from the environmental centrality measure loaded together on the first factor (.41 to .95), whereas the items from the environmental responsibility measure loaded together on the second factor (.53 to .94). This confirmed that the two measures could be used to measure separate spillover mechanisms.

Climate change belief. Belief in climate change was measured using the single item "How likely do you think it is that climate change is occurring?" measured on a scale from 1 (Very likely occurring) to 5 (Very likely not occurring).

Social desirability scale. Social desirability was measured to use as a potential control variable to determine whether it correlated with changes in participants' response to other questionnaire measures. The five-item SDRS-5, a short version of the social desirability scale, was used (Hays, Hayashi, & Stewart, 1989). Items were averaged to make a scale, posttest $\alpha = .69$.

Internal motivation. This measure was included to determine if behavior adoption participants attributed their adopted PEB to their own internal motivation. The measure included seven items from the larger Intrinsic Motivation Inventory (Ryan, 1982), and specifically included items that measured perceived choice to perform the behavior (3 items), the value and usefulness of the behavior (2 items), and effort exerted to perform the behavior well (2 items). One of the perceived choice items ("I felt like I had to do the behavior") was vague and did not contribute to the reliability of the scale. Therefore, it was removed, and the remaining six items were averaged to make a scale $\alpha = .76$.

Procedure

Pretest questionnaire. Participants first completed the pretest questionnaire. The pretest included a brief demographics form followed by all measures listed above except the social desirability and internal motivation scales. A majority of participants completed the

questionnaire online via Unipark survey tool (93%), and the rest requested a hard-copy, which

was mailed to their homes (7%).

   Experimental manipulation. After the pretest questionnaire was completed, the

researcher scheduled a 15-minute phone meeting with each participant to take place within the

following week. The intention of the experimental manipulation was to make the control

condition as similar to the behavior adoption conditions as possible, with the only difference

being whether participants adopted a new PEB. Therefore, the control condition is not a "no

treatment" condition, but simply a condition in which participants did not commit to adoption of

a PEB. Participants in all conditions received a brief description of climate change and how

PEBs can reduce greenhouse gas emissions. The researcher also reminded each participant that

he/she performs some PEBs often and the three individual PEBs the participant had reported

doing most often were listed. Each participant was also told that he/she performs some PEBs less

often and three of the individual PEBs the participant had reported doing least often were listed.

The intention of listing both sets of behaviors was to avoid cueing participants one way or the

other. They were reminded that some of their past actions were environmental, but also that there

are still behaviors they could work on doing more often to become more environmentally-

friendly.

   At this point, approximately one-third of the participants were randomly assigned to the

control condition. For this condition, the researcher explained that there are other things people

can do to "go green", and three additional PEBs that were not included on any questionnaire

measure were listed to them. However, participants were not specifically asked to start adopting

any PEB. Participants were then thanked and reminded that they would receive the posttest

questionnaire in three weeks.

The remaining participants were assigned to the BAM and BAC conditions. Participants in these two conditions were asked if they would be willing to choose a PEB that they perform infrequently and to work on doing it more often for the next three weeks. If the participant agreed (only one participant declined and she dropped out by failing to complete the posttest questionnaire), a list of possible PEBs was given for him/her to choose from. The list included all behaviors the participant reported performing "Almost never", "Occasionally", or "Sometimes" from the pretest individual PEB measure, along with 11 other PEBs that were not previously listed. The list only included PEBs that could be performed multiple times a week such as "Use reusable cloths, sponges, and towels instead of using paper towels" or "Avoid sudden acceleration or sudden braking while driving." The PEBs most commonly chosen for adoption were unplugging appliances and chargers when not in use (16 participants), turning computer off when finished using it (13 participants), and bringing their own bags to the store (7 participants).

Behavior adoption participants were told that a $5 donation would be made to the social organization from which they were recruited regardless of their behavior change, and a reminder was given that they could choose to adopt no PEB at all. The procedure was designed this way to ensure participants did not choose a PEB they already performed regularly, to emphasize that the purpose of the adopted behavior was to help the environment, and to clarify that participants had a choice about which PEB to adopt and whether or not they chose to adopt a PEB at all.

These participants tracked how often they performed their adopted PEB over the three-week span. Two different tracking methods were employed. BAM condition participants responded to text messages they received every-other-day at various times-of-day and were asked to indicate if they performed their adopted PEB on the most recent occasion they had the opportunity (email messages were occasionally used for participants uncomfortable with text

messages). This tracking method should lead to accurate responses by asking participants to focus only on the most recent occasion, thereby reducing memory errors. BAC condition participants used a self-report calendar every-other-day, reporting how many opportunities they had to perform their adopted PEB that day as well as how many times they actually did the behavior. The calendar method required greater memory of the day's behaviors, but removed the experimenter-initiated reminders and instead relied on participants' self-initiation to track their adoption of the PEB.

Posttest questionnaire. Three weeks later, all participants completed the posttest questionnaire via online survey (or hard copy if requested). The posttest contained the same measures from the pretest along with the social desirability scale, and BAM or BAC participants also filled out the internal motivation scale regarding their adopted PEB.

Results

Initial Analyses

The responses of behavior adoption participants were examined to ensure that they felt internally-motivated to perform their chosen behavior. Overall, high internal motivation was demonstrated with participants scoring $M = 6.00$, $SD = 0.75$ and 92% of participants reporting scores 5 or greater on a 7-point scale. Additionally, there was a marginally significant difference between behavior adoption conditions in that BAC participants ($M = 5.85$, $SD = 0.79$) indicated somewhat less motivation than the BAM participants ($M = 6.14$, $SD = 0.69$), $t (84) = 1.84$, $p = .07$, $d = 0.40$.

Social desirability often influences participants' self-report responses (van de Mortel, 2008), and climate change concern is often linked to political orientation in the U.S. (Shwom, Bidwell, Dan, & Dietz, 2010). Therefore, Pearson's correlations were calculated with these

potential control variables and the PEB and political attitude measures to see if they should be

controlled for in further analyses (see Table 1). Due to the large number of tests (44 tests: 22

correlations for each control variable), the Bonferroni adjustment $\alpha = .001$ was used. There were

not any significant correlations using this adjustment. When using the less stringent $\alpha = .10$

without Bonferroni adjustment to look for marginally significant correlations, political

orientation was positively correlated with increased likelihood of installing a water conservation

product, increased likelihood of performing household PEBs, and negatively correlated with the

political behavior of contacting a senator. Social desirability was positively correlated with an

increase in recycling, unplugging appliances, taking a ten-minute shower, and bringing reusable

bags to stores. Therefore, political orientation and social desirability were used as control

variables when examining these specific spillover effects.

Comparing Experimental Conditions

A series of ANOVAs examined differences between those in the control condition, BAM

condition, and BAC condition on change in PEB or political attitude spillover measures from

pretest to posttest (see means and standard deviations on Table 2 and ANOVA tests on Table 3).

Due to the large number of tests (25 tests: 19 ANOVAs and 6 ANCOVAs with control

variables), the Bonferroni adjustment $\alpha = .002$ was used. Contrary to Hypothesis 1, adopting a

new PEB did not show evidence of positive spillover in terms of individual PEBs, household

PEBs, self-reported political behavior, importance of climate-related issues, or policy support.

The three conditions did not demonstrate significant differences on any of the measures (even

when control variables were included) and η_p^2 effect sizes ranged in absolute value from "no

effect" ($<.0001$) to small ($.048$). Eleven of the 19 tests had $\eta_p^2 < .01$, and at most the different

experimental conditions accounted for 4.8% of the variance in change on the spillover measures.

Additionally, the observed effects were not in the same direction (see Table 2). For some

spillover measures, the behavior adoption conditions increased more than the control condition,

but for others the control condition increased more, and in some cases the behavior adoption

conditions decreased.

One political behavior that did show a marked difference between conditions was

whether participants contacted their Senator. A logistic regression was conducted to examine

differences between conditions while controlling for political orientation. For this analysis, the

conditions were dummy coded with control condition = 0 and BAM condition and BAC

condition collapsed together into a behavioral adoption condition = 1. It found that behavior

adoption participants were 3.67 times more likely to mail the postcard (29%) than control

participants (13%), $B = 1.30$, $SE\ B = 0.58$, $e^B = 3.67$, 95% CI for e^B (1.18 to 11.41), χ^2 (1, $N =$

114) = 5.80, $p = .016$. This offered partial support for Hypothesis 1.

Changes in the potential spillover mechanisms were also examined. Adopting a PEB for

three weeks did have some effect on environmental responsibility (see Tables 2 & 3). Using $\alpha =$

.05, there was a significant difference between the conditions, and Tukey post-hoc tests indicated

that the BAM condition ($M = +0.44$, $SD = 0.85$) increased marginally more than the control

condition ($M = +0.03$, $SD = 0.75$), $p = .05$ and the BAC condition ($M = +0.07$, $SD = 0.69$), $p =$

.08), while the BAC and control condition did not differ ($p = .83$). However, there were no

significant differences between experimental conditions on environmental centrality.

Relationships between Spillover Mechanisms with PEB and Political Attitude Measures

The previous analysis found that the BAM condition increased in environmental

responsibility compared to the other two conditions. Therefore, to examine if adoption of a new

PEB in the BAM condition perhaps had an indirect positive spillover effect on PEB and political

attitude measures through increased environmental responsibility, indirect effects analyses were conducted using the PROCESS macro to SPSS (Hayes, 2013) using bootstrapping with 5,000 iterations. For this analysis, the experimental conditions were dummy coded with the control condition and BAC condition collapsed together = 0 and BAM condition = 1. In support of Hypothesis 2, there was a small, positive indirect effect of BAM condition on purchasing organic or local produce through environmental responsibility (95% *CI*: 0.01 to 0.16), as well as a small, positive indirect effect of BAM condition on policy support through environmental responsibility (95% *CI*: 0.009 to 0.12). However, there was not a significant indirect effect of BAM condition on change in any other PEB or political attitude measure. Due to the small size of the indirect effects, the total effects of spillover from BAM condition to these two variables were small and not statistically significant (produce: $B = .05$, $p = .55$; policy support: $B = -.04$, $p = .69$).

Although environmental centrality did not differ significantly between conditions, correlations were run to examine whether increases in environmental centrality, regardless of condition, were related to increases in the PEB and political attitude measures (see Table 1). Change in environmental centrality tended to have small to moderate positive correlations with increases in PEBs and attitudes, and using the Bonferroni adjustment $\alpha = .001$, was significantly positively correlated with increased likelihood of installing an item to make their home more energy efficient. Additionally, change in environmental centrality had few small, negative correlations.

Discussion

The results of this field experiment offer limited support for each hypothesis. In support of Hypothesis 1, purposeful adoption of a PEB led to greater performance of a specific political behavior while controlling for political orientation. Those who adopted a new PEB were more

likely to contact their Senator about climate change when given an easy opportunity. As the one

behavioral assessment that is not a self-report measure in this study, this is an interesting finding.

It offers evidence that when people purposefully adopt a new individual PEB, their political

PEBs may expand as well. Since collective actions are often needed to persuade governments

and other institutions to make policy and infrastructure changes that will have large, lasting

impacts on emissions-reductions, positive spillover from individual PEBs into political PEBs

may be particularly useful for environmental policy makers to consider. Additionally, adopting a

new PEB and tracking that behavior via messaging had small, indirect positive spillover effects

on one individual PEB (purchasing local or organic produce) and one political attitude (policy

support) through increasing sense of environmental responsibility.

      However, there was no other evidence that PEB adoption had a direct or indirect spillover

effect on people's subsequent PEBs or political attitudes. PEB adoption did not make people

more or less likely to perform other individual PEBs or household PEBs and did not

meaningfully impact the importance they placed upon climate-related issues politically. Lack of

findings may be partially due to certain individual PEB measures with quite a few missing values

because participants who chose to adopt that PEB were removed from analysis for that PEB's

spillover, lowering the sample size. Additionally, several individual PEBs displayed ceiling

effects, meaning that during pretest these behaviors were already performed very often (mean

score within one point of maximum score). This made it unlikely that positive spillover could

occur on these PEBs (see Table 2). However, this explanation does not address the lack of

evidence of positive spillover for the other PEBs and political attitudes that were not initially

skewed, nor does it explain the lack of evidence of negative spillover. Importantly, these findings

mirror the small and rather inconsistent positive spillover effects observed in other recent studies

that examined how a PEB intervention spills over into subsequent PEBs (Lanzini & Thøgersen, 2014; Thomas et al., 2016).

There was also some moderate support for Hypothesis 2, in that BAM participants increased in environmental responsibility, which in turn indirectly increased their purchasing of local or organic produce and their support for emissions-reducing policies. This supports past research that demonstrates environmental responsibility is a mechanism through which positive spillover occurs (Steinhorst et al., 2015; van der Werff et al., 2013). This study was specifically designed to ensure people felt internally-motivated to adopt a new PEB, which is important if the PEB adoption is to strengthen the obligation felt to take action on environmental problems (Lacasse, 2013; Truelove et al., 2014). The same outcome might not be observed if people feel strong external pressure to adopt a behavior, or otherwise adopt the behavior for non-environmental reasons, since these contingencies often reduce motivation to perform PEBs (e.g., Evans et al., 2013; Lavergne, Sharp, Pelletier, & Holtby, 2010; Steinhorst et al., 2015; Steinhorst & Matthies, 2016). However, the indirect effects were limited to these two behaviors, and BAC participants who also adopted a PEB did not demonstrate similar effects.

Contrary to Hypothesis 2 and much previous research (Poortinga et al., 2013; van der Werff et al., 2014a; 2014b), environmental centrality was not altered by PEB adoption. One reason why environmental responsibility showed a greater effect may be because the environmental responsibility items were more directly about obligation to perform PEBs, and the environmental centrality items more broadly referred to personal identification with environmental and climate change issues rather than environmental actions. Although PEB adoption did not alter environmental centrality, those who did increase in environmental centrality tended to show small increases in other PEBs and political attitudes, supporting past

research linking identity to increased PEBs (Gatersleben et al., 2014; Whitmarsh & O'Neill, 2010). This finding also supports the notion that environmental responsibility is a more proximal predictor of PEBs than environmental centrality (van der Werff et al., 2013).

Limitations and Future Directions

Behavior adoption participants each chose a PEB they wanted to integrate into their lives, ensuring that participants felt the PEB adoption was the result of their own choice, had value to them, and was worth putting effort into. However, a limitation of this purposeful adoption design was that participants each chose their own PEB to adopt, and these adopted PEBs differed in domain: food consumption, electricity conservation, waste prevention, and transportation. Since PEB spillover is more likely to occur in related domains or among PEBs that require similar resources (Margetts & Kashima, 2017), it is possible that some positive spillover occurred but that the effects were spread across domains and not cumulatively large enough to be detected within any one spillover measure (e.g., those who adopted PEB of eating meatless meals increased in their purchasing of organic or local produce, but those who adopted PEBs in other domains did not). Additionally, all adopted PEBs were relatively simple, but certain PEBs may be more difficult or unique than others. Difficult and unique initial PEBs are sometimes found to be more likely to lead to positive spillover (van der Werff et al., 2014a), but others find easy PEBs can still spillover into difficult PEBs (Lauren, Fielding, Smith, & Louis, 2016). Importantly, even relatively easy or common PEBs can serve as catalysts for positive spillover if they are cued as "environmental" (Cornelissen et al., 2008), which was done in the current study. Therefore, it is unclear if differences in difficulty or uniqueness in adopted PEBs would have impacted the spillover effects observed in this study. Finally, the adopted PEBs also differed in their degree of environmental impact in terms of emissions reductions. However, people tend to

be rather inaccurate in their perceptions of which PEBs are more or less effective at actually

impacting the environment (Attari, DeKay, Davidson, & Bruine de Bruin, 2010), and so this

variability may not have had much impact on likelihood of spillover.

A strength of the current methodology was that it allowed the PEB to be realistically

integrated into participants' daily lives over several weeks. A hurdle to this approach was

constructing a way to track participants' PEB adoption without the measurement itself having an

influence on participants. To address this potential concern, two relatively common tracking

methods were chosen: One where people respond to a message from the researcher to report if

they performed the adopted PEB when they most recently had an opportunity (messaging in the

BAM condition) and one where people simply summarize their total performance of the adopted

PEB at the end of the day (calendar in the BAC condition). Although no differences between the

tracking methods were hypothesized, BAM participants reported a marginally greater change in

environmental responsibility than BAC participants. Interestingly, it seems that receiving

messages about the adopted PEB that required immediate responses increased feelings of

obligation beyond that of simply performing the adopted PEB. However, since both the style of

tracking and the behavior prompt differed in the two tracking methods, it is less clear which

specific aspect of the BAM tracking method led to this difference. Future research examining

PEBs should note that tracking via response to messages has the potential to alter posttest

responses, which may be problematic if the tracking itself is not part of the research question.

Lab studies or observational studies in which performance of the adopted PEB could be observed

without requiring self-report tracking would address this issue. Alternately, this type of

messaging could also be purposefully harnessed. With the rise in popularity of all kinds of

behavior tracking smartphone apps (e.g., steps walked, calories consumed, carbon footprint),

these findings suggest that such programs with messages that require immediate responses about

people's PEB adoption may likely be effective at boosting environmental responsibility. Further

research could specifically focus on the impact of PEB tracking itself without a specific PEB

adoption to determine whether the tracking alone strengthens environmental responsibility and

increases likelihood of positive spillover to future PEBs and/or political attitudes.

This study included a control condition in which participants were reminded of their past

PEBs and their past failures to perform PEBs so that the three experimental conditions were as

similar as possible with exception of the actual PEB adoption. Since cueing past behaviors as

environmental can induce increased subsequent PEBs (Cornelissen et al., 2008), it is possible

that spillover effects may have appeared stronger if behavior adoption conditions were compared

to a control condition in which participants were presented with no information at all, and this

should be examined in future work. In terms of measurement, one limitation of the study was

that three of the questionnaires displayed lower reliability (α between .60 - .70), and so future

work on designing stronger measures of climate-relevant political behaviors and of the

importance of climate-related issues would be beneficial. Additionally, this study was rather low

powered, partially due to participant dropout and removal that reduced the sample to 125 from

the initial 165, and partially due to the small effect sizes observed.

Generalizability of the study findings was also limited in several ways. Participants were

gathered from a variety of different social organizations that provided both male and female

participants, with a wide range of ages and different political orientations. However, most of the

participants were White and well-educated, both demographic groups that are more likely to

espouse environmental concern and to perform PEBs (e.g., Johnson, Bowker, & Cordell, 2004;

Laidley, 2013). Additionally, no conclusions can be drawn about how PEB adoption may

influence people who are skeptical about the science of climate change, since those who indicated climate change was not occurring were not included in this sample. Similarly, Republicans, politically conservative individuals, and younger individuals were more likely to drop out or be removed from the study, so the findings presented are more representative of the spillover effects to be expected of older, liberal Democrats. Finally, the study was limited to Massachusetts residents. Participants' willingness to consider climate change as an issue of political importance should be considered in the context of a more liberal-leaning U.S. region. Future research on changes in political attitudes or actions after adopting PEBs should examine more conservative U.S. regional contexts.

Conclusions

This study offers some evidence for small positive spillover effects and virtually no evidence for negative spillover in a scenario in which people purposefully adopt a new PEB. Since environmental responsibility increased after adoption among those responding to messaging, it seems that, if anything, purposeful adoption of a new PEB is more likely to trigger the sense of obligation to perform more PEBs rather than a heightened sense of environmental centrality. The greatest impact was on likelihood of contacting their Senator, demonstrating that individual PEBs can spillover into political PEBs. However, the positive spillover effects were few and rather small. In sum, when someone works to change a behavior in his/her life to become more environmentally friendly, it probably will not lead to a dramatic domino effect of positive spillover. But it can't hurt, and it might help.

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Table 1

Pearson's Correlations Between Potential Controls, Spillover Mechanisms, and PEB & Political Attitude Spillover Measures

Potential Controls	1.	2.	3.	4.
1. Political orientation	-			
2. Social desirability	.06	-		
Spillover Mechanisms				
3. Δ Environmental centrality	-.02	-.01	-	
4. Δ Environmental responsibility	.05	.06	.26**	-
Individual PEBs				
Δ Recycle	.13	.19*	-.08	.11
Δ Turn off lights	.12	-.06	.01	.17†
Δ Unplug	-.06	.15†	.07	.08
Δ 10 min. shower	.01	.18†	.16†	.05
Δ Turn off TV	.07	-.02	.28**	.16†
Δ Reusable cup	-.02	.01	.06	.04
Δ Meatless	.03	.03	-.04	-.01
Δ Turn off computer	.11	.05	.07	.14
Δ Organic/local	.04	.06	.07	.29**
Δ Transportation	-.03	.01	.02	.06
Δ Layer on clothes	.15	.03	.16†	.12
Δ Reusable bags	.02	.17†	-.05	.08
Household PEBs				
Δ Household total	.18†	-.01	-.03	-.14
Δ Energy audit	-.06	.05	.16	.33**
Δ Efficiency	.04	.07	.40***	.02
Δ Reduce water	.32*	-.11	.35**	.18
Political PEBs & Attitudes				
Δ Political behaviors	.04	.15	.11	.07
Δ Climate issues	.09	-.12	.23*	.11
Δ Policy support	.03	.08	.18*	.23*
Contact senator	-.27**	.01	-.11	-.14

Δ indicates a <u>change</u> variable (Score from posttest – Score from pretest); † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$; Bonferroni adjustment α = .001 for correlations with potential control variables (column 1 & 2); Bonferroni adjustment α = .001 for correlations with spillover mechanisms (column 3 & 4)

Table 2

Means and Standard Deviations for Dependent Variables

	Pretest Scores	Posttest Scores	Δ Control Condition	Δ BAM Condition	Δ BAC Condition
Spillover Mechanisms					
Environmental centrality	4.66	4.76	+0.17	+0.19	-0.07
	(1.16)	(1.13)	(0.48)	(0.70)	(0.63)
Environmental responsibility	5.07	5.26	+0.03	+0.44	+0.07
	(1.14)	(1.10)	(0.75)	(0.85)	(0.69)
Individual PEBs					
Recycle	4.72[a]	4.74	-0.03	+0.02	+0.02
	(0.76)	(0.66)	(0.28)	(0.46)	(0.35)
Turn off lights	4.55[a]	4.56	-0.10	+0.07	+0.05
	(0.63)	(0.64)	(0.68)	(0.63)	(0.61)
Unplug	3.24	3.44	-0.05	-0.16	+0.07
	(1.41)	(1.32)	(0.07)	(1.20)	(0.94)
10 min. shower	4.11[a]	4.25	+0.16	+0.09	+ 0.10
	(1.06)	(1.00)	(0.89)	(0.76)	(0.91)
Turn off TV	4.34[a]	4.39	+0.21	+0.02	-0.13
	(0.92)	(0.92)	(0.66)	(0.87)	(0.80)
Reusable cup	4.02[a]	4.06	0.00	+0.03	-0.13
	(1.09)	(0.97)	(1.03)	(1.11)	(0.85)
Meatless	4.14[a]	4.02	0.00	-0.34	0.00
	(1.28)	(1.22)	(0.76)	(0.78)	(0.97)
Turn off computer	3.39	3.58	-0.05	+0.22	-0.18
	(1.34)	(1.34)	(0.84)	(0.99)	(1.09)
Organic/local	3.40	3.42	-0.05	+0.07	+0.08
	(0.99)	(1.01)	(0.83)	(0.75)	(0.62)
Transportation	2.35	2.34	-0.11	0.00	+0.08
	(1.24)	(1.13)	(0.76)	(0.93)	(0.81)
Layer on clothes	4.17[a]	4.28	+0.28	-0.07	+0.15
	(0.83)	(0.84)	(0.76)	(0.96)	(0.65)
Reusable bags	3.48	3.62	0.00	-0.07	+0.21
	(1.49)	(1.42)	(0.52)	(0.61)	(0.93)
Household PEBs					
Household total	3.26	3.29	+0.05	+0.06	-0.01
	(1.27)	(1.17)	(0.79)	(0.68)	(0.69)
Energy audit	3.92	4.29	-0.09	+0.30	+0.24
	(1.55)	(1.61)	(1.06)	(1.20)	(0.93)
Efficiency	4.56	4.36	-0.21	0.00	-0.15
	(1.42)	(1.63)	(1.21)	(1.35)	(1.35)
Reduce water	4.24	4.43	+0.29	+0.05	+0.40
	(1.64)	(1.52)	(0.90)	(0.95)	(1.59)
Political PEBs & Attitudes					
Political behaviors	0.37	0.39	+0.04	+0.01	+0.01
	(0.27)	(0.29)	(0.16)	(0.16)	(0.13)
Importance of climate issues	5.34	5.24	-0.07	-0.04	-0.14
	(1.17)	(1.14)	(0.70)	(0.80)	(0.60)
Policy support	3.67	3.77	+0.08	+0.10	+0.15
	(0.76)	(0.69)	(0.38)	(0.41)	(0.39)

Means are listed on top and standard deviations are in parentheses below. Δ indicates a <u>change</u> variable (Score from posttest – Score from pretest). [a] indicates that pretest score displayed a ceiling effect (negatively skewed).

Table 3

Comparing Experimental Conditions on Dependent Variables

	F	df_b	df_w	p	η_p^2
ANOVAs of Spillover Mechanisms					
Δ Environmental centrality	2.09	2	117	.13	.03
Δ Environmental responsibility	3.48	2	117	.03	.06
ANOVAs of Individual PEBs					
Δ Recycle	0.23	2	119	.79	<.01
Δ Turn off lights	0.87	2	117	.42	.02
Δ Unplug	0.39	2	103	.68	<.01
Δ 10 min. shower	0.07	2	119	.93	<.01
Δ Turn off TV	1.77	2	120	.18	.03
Δ Reusable cup	0.26	2	115	.77	<.01
Δ Meatless	2.32	2	119	.10	.04
Δ Turn off computer	1.56	2	105	.22	.03
Δ Organic/local	0.37	2	120	.69	<.01
Δ Transportation	0.45	2	119	.64	<.01
Δ Layer on clothes	2.00	2	122	.14	.03
Δ Reusable bags	1.69	2	114	.19	.03
ANOVAs of Household PEBs					
Δ Household total	0.08	2	85	.93	<.01
Δ Energy audit	0.89	2	71	.42	.02
Δ Efficiency	0.16	2	70	.85	<.01
Δ Reduce water	0.48	2	55	.62	.02
ANOVAs of Political PEBs & Attitudes					
Δ Political behaviors	0.56	2	118	.57	<.01
Δ Climate issues	0.22	2	118	.80	<.01
Δ Policy support	0.29	2	118	.75	<.01
ANCOVAs of Individual PEBs	F	df_b	df_w	p	η_p^2
Δ Recycle model	1.74	3	118	.16	.04
Control: Social desirability	4.50	1	118	.04	.04
Experimental condition	0.50	2	118	.61	<.01
Δ Unplug model	1.82	3	118	.15	.04
Control: Social desirability	2.47	1	118	.12	.02
Experimental condition	1.30	2	118	.28	.02
Δ 10 min. shower model	1.31	3	119	.28	.03
Control: Social desirability	3.73	1	119	.06	.03
Experimental condition	0.03	2	119	.97	<.01
Δ Reusable bags model	1.83	3	118	.15	.04
Control: Social desirability	3.31	1	118	.07	.03
Experimental condition	0.91	2	118	.40	.02
ANCOVAs of Household PEBs					
Δ Reduce water model	2.97	3	52	.04	.15
Control: Political orientation	7.78	1	52	.007	.13
Experimental condition	1.30	2	52	.28	.05
Δ Household behaviors model	1.11	3	80	.35	.04
Control: Political orientation.	2.95	1	80	.09	.04
Experimental condition	0.30	2	80	.74	<.01

Δ indicates a <u>change</u> variable (Score from posttest – Score from pretest). Bonferroni adjustment α = .002 for tests on PEB or political attitude spillover measures.
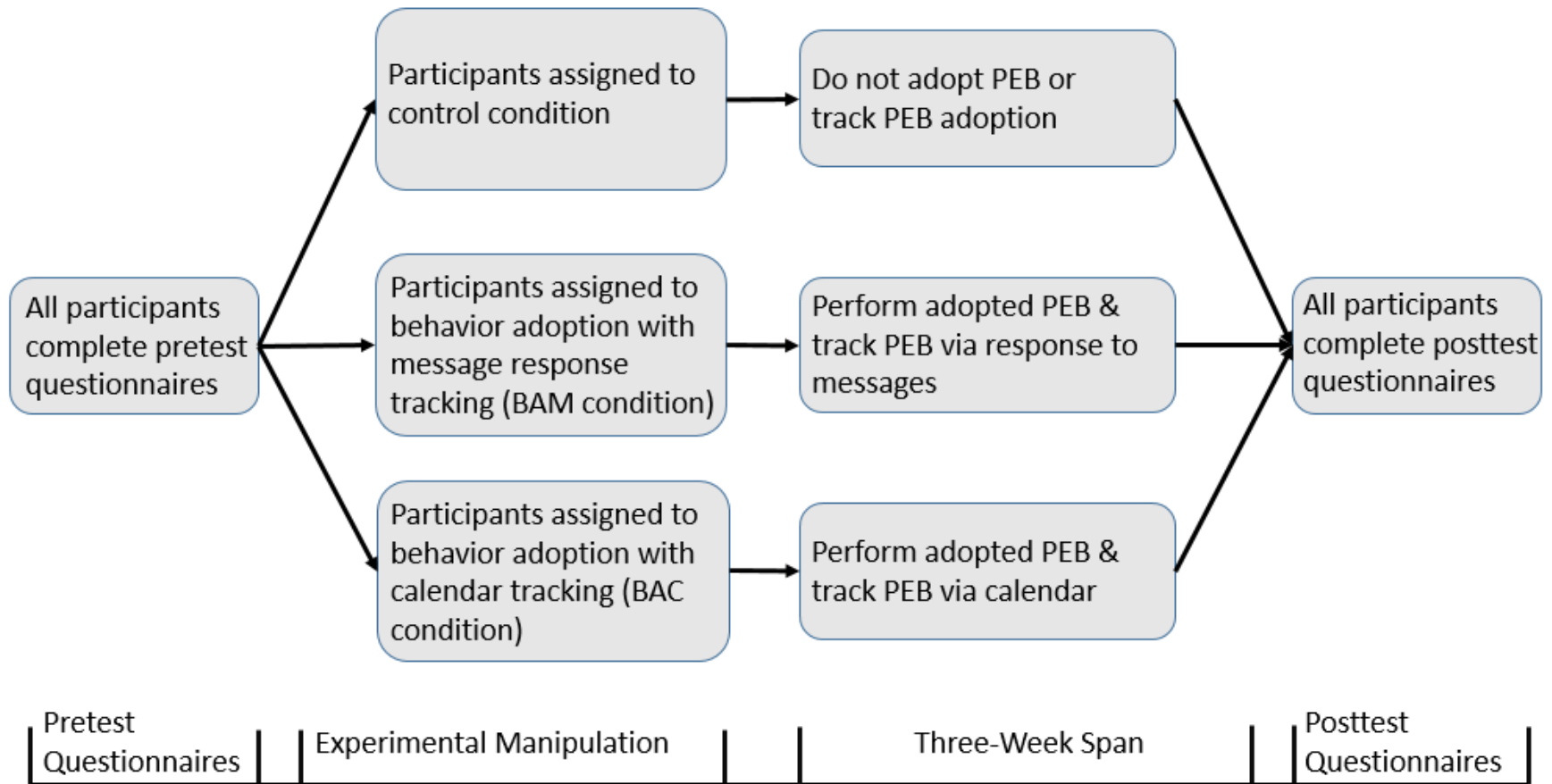
Figure 1: Illustration of the experimental design: Indicates the timeline during which the experiment occurred (see timeline at bottom of image) and explains the procedures for participants in the three different experimental conditions.

APPENDIX A

Table 1A
Items on Questionnaire Measures

Individual Pro-Environmental Behavior Items
1) Recycle items of plastic, glass, paper, and cans
2) Turn the lights off each time I leave an empty room
3) Unplug small appliances and chargers from the wall when they are not in use
4) Take showers which last for 10 minutes or less
5) Turn off the T.V. each time I leave an empty room
6) Use my own reusable drinking container each time I get water, coffee, or other beverages
7) Eat at least one meal without meat (beef, pork, chicken, seafood, etc.) a day
8) Turn my computer fully off when I am not using it
9) Purchase organic or local produce
10) Instead of driving separately, carpool or take public transportation
11) Put more clothes on when I feel cold, rather than turning up the heat
12) Bring my own bags to use when shopping for groceries or other items
Household Pro-Environmental Behavior Items
1) Request an energy audit to find out how to make your home more energy efficient
2) Switch to renewable electricity through your electricity provider (NSTAR Green, New England GreenStart, etc.)
3) Install a renewable energy system (solar panels, wind turbine, etc.) for your home
4) Purchase a low-emission motor vehicle (hybrid, electric, biofuel)
5) Install an item to make your house more energy efficient (insulation, new heating system, etc.)
6) Purchase a product to reduce water usage in your home (low-flush toilet, low-flow shower head, etc.)
Political Behavior Items
1) Discussed climate change with family or friends in an informal setting
2) Belonged to an organization concerned with climate change
3) Gave money to an organization which works on the issue of climate change
4) Wrote a letter to a public official or newspaper expressing my view on climate change
5) Participated in a protest, rally, or other kind of public demonstration about climate change *(item removed)*
Importance of Climate-Related Issues Items
1) Strengthening the nation's economy
2) Improving the educational system
3) Dealing with climate change *(used in climate-related issues scale)*
4) Defending the country from future terrorist attacks
5) Improving the job situation
6) Dealing with the nation's energy problem
7) Reducing health care costs
8) Dealing with the issue of illegal immigration
9) Reducing federal income taxes for the middle class
10) Protecting the environment *(used in climate-related issues scale)*

Policy Support Items

1) Provide tax rebates for people who purchase energy-efficient vehicles

2) Require electric utilities to produce at least 20% of their electricity from wind, solar, or other renewable energy sources, even if it costs the average household an extra $100 a year initially

3) Sign an international treaty that requires the United States to cut its emissions of carbon dioxide 90% by the year 2050

4) Constructing bike paths and installing bike lanes on city streets

5) Regulations requiring any new home to be more energy efficient: this would increase the initial cost by about $7,500 but save $17,000 in utility bills over 30 years

6) Changing your county's zoning rules to require that neighborhoods have a mix of housing, offices, schools, and stores close together, to encourage walking and decrease the need for a car

7) A 10-cent fee added to each gallon of gasoline you buy, to improve local public transportation

Environmental Responsibility Items

1) I feel morally obligated to do what I can to prevent climate change

2) It is important for me to do my part, and change my personal behaviors to help slow climate change

3) Going green is an alternative lifestyle, which is for some people, but not for me *rev*

4) Changing personal behaviors won't make any difference in slowing down climate change *rev*

Environmental Centrality Items

1) I consider myself a climate-concerned person

2) I consider myself 'green'

3) I consider myself an environmentalist

4) Climate change is an important issue to me personally (adapted from Holland et al., 2002)

5) I am certain about my opinions regarding climate change (adapted from Holland et al., 2002)

6) My attitude towards climate change is central to who I am (adapted from Holland et al., 2002)

7) My attitude towards climate change represents my personally important values (adapted from Holland et al., 2002)

Social Desirability Items

1) I sometimes try to get even rather than forgive and forget. *rev*

2) No matter who I'm talking to, I'm always a good listener

3) There have been occasions when I took advantage of someone. *rev*

4) I sometimes feel resentful when I don't get my way. *rev*

5) I am always courteous even to people who are disagreeable.

Internal Motivation Items

1) I believe I had some choice about doing this behavior.

2) I felt like I had to do this behavior. *rev (item removed)*

3) I did this behavior because I wanted to.

4) I think that doing this behavior is useful for reducing my impact on the climate and environment.

5) I would be willing to continue doing this behavior because it has some value to me.

6) It was important to me to do well at this behavior.

7) I didn't try very hard to do this behavior. *rev*

rev indicates that the item was reverse-scored before averaging the scale