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Analysis

Unpacking the Relationships Between Pro-environmental Behavior, Life Satisfaction, and Perceived Ecological Threat☆

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ABSTRACT

Using samples from Canada ($N = 1220$) and the United States ($N = 1001$), we examined how performing a variety of pro-environmental behaviors (PEBs) predicted life satisfaction. Controlling for demographic characteristics and perceptions of ecological threat, more frequent engagement in pro-environmental behaviors predicted higher life satisfaction. All but 2 of 39 PEBs were positively related to life satisfaction, suggesting that the relationship generalizes across behaviors. However, life satisfaction was more strongly predicted by behaviors that involved more social interaction, behaviors that were more easily observed, and by behaviors that involved direct costs in terms of money, time, and effort. Evidence for the role of direct costs was stronger than that for socialness or observability. In addition, perceptions of ecological threat negatively predicted life satisfaction, but this effect was partially suppressed by higher engagement in pro-environmental behavior. Results suggest that lifestyle changes that might be part of a sustainable society need not represent threats to well-being, and might even provide a means of enhancing well-being.

1. Introduction

The "greening" of individual behaviors can be an important component of mitigating climate change and other human-caused environmental problems (Dietz et al., 2009; Stern et al., 1997). Behavioral changes can include a variety of pro-environmental behaviors (PEBs), such as shifting consumption patterns to relatively low-impact alternatives (e.g., buying a more efficient gasoline car or switching to an electric car) and decreasing overall consumption (Stern et al., 1997; Shwom and Lorenzen, 2012). While PEBs often involve personal costs, past research has shown that PEB engagement is positively associated with personal well-being (Kasser, 2017), possibly because assisting the environment may confer similar positive well-being effects as engaging in prosocial behavior toward other people (Dunn et al., 2008, 2014). Here we examine the robustness of this relationship by exploring whether engagement in 39 different PEBs is associated with greater life satisfaction. In addition, we test whether the strength of the relationship between PEB and well-being depends on the extent to which PEBs involve direct costs, provide opportunities for social connection, and are easily observed by others. In addition, we incorporate perceived ecological threat in our analysis, and consider whether PEB might provide a way of coping with the negative well-being consequences of perceiving ecological threat.

1.1. Direct Costs of Engaging in PEBs

There are many barriers to engaging in pro-environmental behaviors—including the fact that such behaviors can be costly to the individuals who perform them (Pruneau et al., 2006; Quimby and Angelique, 2011; Tobler et al., 2012). In this paper, we focus on "direct costs," by which we mean the time, money, and effort that a person must expend to complete a behavior. For instance, many PEBs require time and effort (e.g., sorting recycling, participating in an environmental group), cost money (e.g., eating organic food rather than conventionally grown), or require an initial financial investment (e.g., buying energy efficient appliances). Pro-environmental behavior can also be inconvenient or involve personal sacrifice (e.g., public transit does not provide door-to-door transportation as driving a privately-owned automobile does). Given the direct costs that are often associated with PEBs, a narrow approach to psychological well-being might assume that spending time, money, or effort on PEBs would undermine well-being by depriving people of opportunities to spend their resources in ways that more directly benefit themselves. Indeed, in many regions, official analyses of environmental policy consider consumer impacts only in financial terms (e.g. cost-benefit analyses of fuel economy regulation, United

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States Environmental Protection Agency, 2016). However, both economists (e.g., Welsch and Kühling, 2010) and psychologists (e.g., Kasser, 2017) have demonstrated that there are many reasons why people might be motivated to spend time, money and effort on the health of the natural environment, as well as reasons why such expenditures might improve individual well-being.

1.2. Pro-environmental Behavior as Prosocial Behavior

Pro-environmental behaviors are "prosocial"—they benefit others, often with some direct costs to the actor. In this paper, we use the term prosocial to refer to behaviors that the actor understands to have positive consequences for others, but do not mean to imply anything about the motivations for the behavior, as people engage in prosocial behavior for myriad reasons, and many are not purely prosocial in intent. Most obviously, PEBs can be prosocial because people might recognize how their actions promote the health and well-being of other people now and in the future. If the conceptualization of prosocial behavior is extended to include acts that benefit other species (beyond just humans), then PEBs can also be seen as prosocial because they can contribute to the health of the natural environment more generally.

A growing body of research indicates that humans experience greater subjective well-being (SWB) after engaging in prosocial behavior (e.g., Penner et al., 2005). SWB is defined here, as in past research, as high levels of positive affect, low levels of negative affect, and a positive evaluation of one's life overall (i.e. high life satisfaction; Diener, 1984). People who volunteer typically report higher levels of well-being than those who do not (e.g., Borgonovi, 2008; Thoits and Hewitt, 2001; Vecina and Fernando, 2013), and individuals who donate more money to charity report higher levels of happiness than those who give less (Dunn et al., 2008). Importantly, experimental studies confirm that prosocial behavior has a causal effect on well-being. People randomly assigned to spend $5 or $20 on others were significantly happier at the end of the day than people assigned to spend a similar amount on themselves (Dunn et al., 2008). Similarly, people randomly assigned to commit kind deeds for others or "the world" reported greater happiness than those assigned to commit kind deeds for themselves (Nelson et al., 2016). Recent research indicates that the causal impact of generosity may be detectable in young children (Aknin et al., 2012) as well as in rich and poor countries around the world (Aknin et al., 2013a, 2013b; Aknin et al., 2015), supporting the possibility that this relationship may be a universal feature of human behavior.

There are a number of reasons why doing good for others might contribute to well-being. First, humans are not only motivated by individual gain, but are social, interdependent, and at least sometimes motivated to benefit others (Batson et al., 1988). When people's primary motivation is truly altruistic, they tend to feel better when they are successful at reducing someone's need (Batson and Weeks, 1996). People help for more egoistic reasons as well, such as reducing one's own distress at seeing others suffer (Cialdini et al., 1987). Economists have also argued that people engage in prosocial behavior because they are motivated to experience the "warm glow" of giving (Andreoni, 1990; Bénabou and Tirole, 2006). For example, people might be motivated to engage in prosocial behavior in order to experience the pride that comes from seeing the self as moral and willing to sacrifice the self for others. When behaviors are observable by others, people might engage in prosocial behavior in order to be seen positively by others, and thus enhance their reputation (Harbaugh, 1998; Sexton and Sexton, 2014). For many people, prosocial behaviors are motivated by deeply-held values, such as biospheric and altruistic values (Stern et al., 1999), and thus prosocial behaviors might enhance well-being because they contribute to the fulfillment of core, guiding goals (Ryan and Deci, 2000). Although a full discussion of the theoretical literature on why prosocial behavior contributes to well-being is beyond the scope of this paper, the empirical evidence points to a robust effect: humans feel good after helping others. Thus, to the extent that people recognize PEBs as benefiting the natural world and/or its current and future inhabitants, humans might also feel good after engaging in PEB.

1.3. Existing Evidence of the Relationship Between PEB Engagement and Well-being

Existing evidence is consistent with the idea that voluntary engagement in PEBs can promote well-being (Venhoeven et al., 2013). For example, PEB and subjective well-being were positively correlated in samples from the U.S.A. (Brown and Kasser, 2005; Jacob et al., 2009), Mexico (Corral-Verdugo et al. 2011), Sweden (Kaida and Kaida, 2016), Spain (Suárez-Varela et al., 2016) and China (Xiao and Li, 2011). Using global data from the World Values Survey, Welsch and Kühling (2010) found that recycling, water conservation, and the purchasing of "environmentally-friendly" products predicted life satisfaction controlling for country, income and other demographic variables. In a sample of UK households, Binder and Blankenberg (2017) found that PEBs were related to life satisfaction; however, an even stronger predictor of life satisfaction was participants' subjective assessments of the sustainability of their behaviors, suggesting that it is not the behaviors themselves that affect subjective well-being, but the sense that those behaviors have had positive consequences for the environment.

One serious limitation of the existing evidence, however, is that prior studies have not conducted systematic analyses of the PEB-well-being relationship at the level of different behaviors. Indeed, of the studies of which we are aware, the median number of behaviors measured is 10, and all but one study had 14 or fewer items. Brown and Kasser (2005, study 2) used 66 PEB items; however, they did not conduct analyses comparing individual behaviors. For that reason, it is possible that at least some of the previously observed relationships might be due to idiosyncrasies of the measured behaviors, rather than their pro-environmental implications. For instance, reducing household energy use might save money that could be then spent in ways that improve well-being. Perhaps purchasing organic food leads to more healthful food choices that contribute to well-being, or cycling instead of driving promotes well-being due to the beneficial effects of physical exercise. Without examining the PEB-well-being relationship across a large range of pro-environmental behaviors, it becomes difficult to discern the extent to which these alternative explanations might explain some of the previously observed relationships between PEB and well-being. Thus, the existing literature has yet to make clear whether the relationship between PEB and well-being is limited to particular types of behaviors, or if the relationship is stronger for certain types of behaviors than others. We address this gap by conducting a behavior-level analysis of the relationship between individual PEBs and well-being. To do so, we measured 39 PEBs—more than almost all the prior studies. More importantly, however, we used these data to test the extent to which the PEB-well-being relationship generalized across a variety of behaviors, and whether heterogeneity in the size of the relationship could be systematically linked to differences between PEBs. Below we consider three possible moderators of the link between PEB and well-being.

1.3.1. PEBs Differ in Their Direct Costs (Time, Money, and Effort)

Although PEBs in general might include direct costs, PEBs clearly differ in the extent to which they require time, effort, or money. Indeed, some PEBs save money (e.g., reduced electricity use), time (e.g., taking shorter or fewer showers), or effort (doing only full loads of laundry). Research on pro-social behaviors suggests that incurring direct costs might enhance the well-being benefits of PEBs. Aknin et al. (2012) found that toddlers smile more when engaging in costly prosocial behavior (giving away their own edible treats) than when engaging in an identical but non-costly act (giving away the same treat that did not belong to them). It might also be the case that more costly PEBs (i.e. those requiring more time, effort, or money on behalf of the environment) lead to greater boosts to well-being than less costly PEBs. From this perspective, doing good for others improves well-being not

just because of the potential good done, but also because that good comes from the contribution of one's own resources. Relatedly, it might be that more costly PEBs are perceived as more efficacious in helping the environment, and for that reason as well we would assume that costly PEBs would be more strongly related to well-being (Aknin et al., 2013b; Batson and Weeks, 1996; Binder and Blankenberg, 2017). Therefore, research on prosocial behavior suggests that PEBs that are low-cost or provide benefits in time, money, or effort might be less likely to promote well-being than PEBs that have higher direct costs.

1.3.2. PEBs Differ in How Easily They Are Observed by Others

Some PEBs are relatively private and observed by few people (e.g., turning off one's tap while brushing teeth) and others are more public (e.g., participating in an environmental group, or driving a fuel-efficient vehicle). Some theories suggest that prosocial acts contribute to well-being by boosting one's reputation (e.g., Harbaugh, 1998; Sexton and Sexton, 2014). If engaging in PEB promotes well-being because of its reputational consequences, we would expect more easily-observed PEBs to be more strongly related to well-being than PEBs that go unobserved.

1.3.3. PEBs Differ in Terms of the Opportunities They Provide for Social Connection

Another reason that engaging in PEBs might improve well-being is that some PEBs provide opportunities to fulfill one of humans' most fundamental needs—social connection (Baumeister and Leary, 1995; Diener and Seligman, 2002; Ryan & Deci, 2000). People report the highest levels of well-being when socializing or connecting with other people, and the lowest levels of well-being in time spent alone or working independently (Csikszentmihalyi and Hunter, 2003; Kahneman et al., 2004). Although many PEBs are unlikely to increase social connections (e.g., turning off lights when leaving a room), others necessarily involve social interaction (e.g., talking to other people about environmental issues, participating in an environmental group). Because social connection is one of the most robust and reliable predictors of well-being (Diener and Seligman, 2002; Haslam et al., 2017; Lyubomirsky et al., 2005), it seems likely that PEBs providing opportunities for interaction and relationship-building will be especially effective in promoting well-being.

1.4. Ecological Threat and Well-being

Another gap in prior studies is a lack of attention directed to the potential role of perceived ecological threat in the PEB-well-being relationship. Although PEB engagement might enhance well-being, some beliefs that promote sustainable behavior might have a *negative* effect on well-being. Specifically, the perception of environmental harm predicts engagement in PEBs (Bamberg and Möser, 2007; Johnson and Frickel, 2011). Perceiving environmental harm also has the potential to undermine well-being. A number of psychological perspectives on climate change and other environmental issues point out that recognizing environmental crises is psychologically threatening, and thus prompts denial, distraction, and minimization (Pipher, 2013). For example, acknowledging the negative impacts of climate change threatens beliefs that the world is a just place (Feinberg and Willer, 2011), challenges free-market ideology (Heath and Gifford, 2006; Klein, 2014), questions the viability of dominant systems more generally (Feygina et al., 2010), and can lead to a sense of disempowerment (Rich et al., 1995). Further, perceptions of environmental crises can raise existential questions about the meaning of human existence (Doherty and Clayton, 2011; Fritze et al., 2008). Indeed, van der Linden (2014) found that accurate knowledge of climate change predicted negative affect, and in an experiment conducted by Greitemeyer (2013), participants who watched a film about the negative consequences of climate change felt less positive affect than participants who watched a film denying climate change. Similarly, Welsch and Kühling (2011) found that the perception of a need to move society toward renewable energy was negatively related to life-satisfaction.

Because perceived ecological threat is positively correlated with PEB, but negatively related to well-being (see Verhofstadt et al., 2016), it is important to control for ecological threat when examining the relationship between PEB and well-being. However, this is not simply a methodological issue, but one with theoretical and practical importance. If the hypothesis that engaging in PEB promotes well-being is correct, then PEB might be conceptualized as a way people can respond to ecological threat that both benefits the environment and partly counteracts the emotional harm posed by recognizing environmental crises. In other words, it could be that perceived ecological threat has a direct negative relationship with well-being, but also has a positive indirect effect mediated by PEB.

1.5. The Current Study and Extensions to Prior Research

Using nationally representative survey data from Canada and the United States, we investigated the relationship between engagement in 39 PEBs and life satisfaction. We used life satisfaction as our dependent variable because it is a commonly used indicator of subjective well-being that focuses on the cognitive evaluation of one's life as a whole. Past research has shown that life satisfaction measures are reliable and valid indicators of well-being: life satisfaction is influenced by objective life conditions, and predicts other important well-being measures and outcomes, including suicide (see Diener et al., 2013 for a review). Furthermore, prior research has found that prosocial behavior predicts life satisfaction (e.g., Aknin et al., 2013a, 2013b), and thus life satisfaction is an appropriate measure to test the possible effects of pro-environmental behavior.

Like prior work on PEB and well-being, our study is correlational, and thus cannot be used to make causal claims. Indeed, experimental methods are needed to establish causal effects, and experiments testing the effect of PEB on well-being would be an important addition to the literature. However, the current study makes several other important and novel contributions. Providing one of the most thorough tests of the relationship between engaging in PEB and life satisfaction to date, we examined the generalizability and heterogeneity of the relationship across 39 PEBs. Specifically, we examined whether the size of the relationship between individual PEBs and life satisfaction varied as a function of the direct costs (time, money, effort), socialness, and observability of each behavior. In addition, unlike prior research, we also included perceptions of ecological threat in our analyses. We controlled for ecological threat when assessing the PEB-life-satisfaction relation. More importantly, we tested PEB as a mediator of an indirect positive relationship between perceived ecological threat and life satisfaction. Finally, this is the first study to examine the relationship between PEB and subjective well-being in national samples of people in United States and Canada. These are important contexts in which to understand PEB, as these countries are among the top per capita emitters of greenhouse gasses (World Resources Institute, 2014).

We operationalized “pro-environmental behaviors” as behaviors that are normatively perceived by people in Canada and the United States as benefitting the natural environment. Examples include buying energy efficient appliances, buying organic food, walking or cycling instead of driving, and using reusable bags when shopping. This list of PEBs was not meant to be systematic or exhaustive—rather it is meant to capture a wide range of PEBs that Canadian and U.S. individuals commonly mention in reference to a pro-environmental lifestyle. That said, many of these 39 PEBs overlap with the 24 PEBs used by Whitmarsh and O'Neill (2010) to measure PEB engagement. We recognize that some of the behaviors that people perceive as benefiting the environment might not objectively have much of an impact (e.g. from a lifecycle impact perspective); however, our present hypotheses apply to behaviors that people subjectively construe as pro-environmental, before, during, or after engagement in the behavior. Thus, we made no attempt to restrict

our measured behaviors to those that objectively would make a "big" difference—an issue beyond the scope of this paper. Nonetheless, we do examine behaviors that arguably can make non-trivial contributions to climate change mitigation, resource conservation and other environmental issues, such as eating a vegetarian diet (Hedenus et al., 2014) or buying a fuel efficient vehicle (Dietz et al., 2009).

1.6. Hypotheses

Consistent with prior research on the relation between subjective well-being and both prosocial and pro-environmental behavior, we predicted that more frequently engaging in PEB would be positively related to life satisfaction, controlling for demographic characteristics, including age, gender, and income (Hypothesis 1). Unlike any prior research on PEB and well-being, we also controlled for perceptions of ecological threat, which we predicted would be negatively related to well-being (Hypothesis 2). Based on the idea that ecological threat promotes PEB, we predicted that PEB would mediate a positive relationship between ecological threat and life satisfaction that suppresses (i.e., counteracts) the negative well-being effects of ecological threat (Hypothesis 3).

We examined the generalizability of a positive relationship between PEB and well-being across a large number of behaviors, and tested three novel hypotheses regarding systematic variance in the effects of specific behaviors. Consistent with recent work on prosocial behavior, we predicted that the positive relationship between engaging in PEB and life satisfaction would be stronger for PEBs that had direct costs for the actor in terms of time, effort, and money (Hypothesis 4). Similarly, and consistent with the idea that PEB might promote well-being by improving one's reputation, we tested the hypothesis that more observable behaviors would be more strongly linked to life satisfaction (Hypothesis 5). We also examined whether the relationship between PEBs and life satisfaction was stronger for PEBs that were higher in socialness—the extent to which they provided opportunities for social interaction and the building of social relationships (Hypothesis 6).

2. Method

2.1. Participants and Procedure

The survey instrument was designed primarily for a study exploring citizen engagement in PEBs, and was administered with samples of Canadian and U.S. citizens drawn from a Web-panel maintained by Decision Analyst, a market research company. Data from both samples were collected in February 2013, and respondents were offered a nominal reward worth $5 ($CDN or $US) for completion. The target populations were citizens aged 19 years or older in each country, and the samples were recruited in effort to represent Canadian and U.S. citizens by age and gender. The Canadian survey invitation was sent to over 54,000 individuals. Of the first 2046 that responded, 534 did not meet the demographic quotas, and 292 did not complete the full survey, leaving a total sample size of 1220. The provinces of British Columbia, Alberta, and Ontario were intentionally over-sampled in order to allow for regional comparisons, and a French version of the survey was made available for French-speaking Canadians. The U.S. survey invitation was sent to over 14,000 individuals, and of the first 1395 that responded, 240 did not meet the demographic quotas, and 155 did not complete the full survey, leaving a total sample size of 1000.

Table 1 depicts sample distributions by gender, age, education, household income and residence location (urban/suburban or rural) compared to Canadian and U.S. census population statistics. There are several biases in both samples: males are slightly over-represented, the 19–24 age-group is under-represented, and those with Bachelor's and Graduate degrees are over-represented. Both samples include wide variations in respondent characteristics, and the slight biases in the sample do not represent serious threats to generalizability, particularly when using regression analysis that controls for demographic characteristics (Babbie, 2013).

Table 1
Sample demographic characteristics (compared to census data).

	United States		Canada	
	Survey[a]	Census[b]	Survey[a]	Census[c]
Respondent gender (%)				
Female	39.9	50.8	43.4	51.0
Respondent age (%)[d]				
19–34 years old (20–25 for Census)	19.5	29.3	17.9	25.4
35–54 years old	46.7	41.2	39.3	38.3
55 years and older	33.9	29.5	42.8	36.4
Respondent education level (%)[e]				
Bachelor's degree	38.3	20.0	41.6	16.5
Graduate degree	21.2	11.6	7.3	9.4
Household income (%)[f]				
<$70k/year	57.2	62.4	63.5	53.1
$70–99k/year	19.6	15.1	19.3	21.4
$100k/year or more	23.2	22.5	16.4	25.5
Household residence (%)				
Urban or suburban	81.6	80.7	83.1	81.1
Rural	18.4	19.3	16.9	18.9

[a] All survey respondents are 19 or older.
[b] U.S. age, sex and residence data are from 2010 census data, and income and education are from 2013 census data (www.census.gov).
[c] Canada income data is from 2006 census data, and age, sex, education and residence data are from 2011 census data (www.statcan.gc.ca).
[d] Age distributions for Canada and U.S.A. census are for the segment of the population that is aged 20 or older.
[e] Education figures for Canada and U.S.A. census are for the population aged 25 or older.
[f] Excluding respondents that did selected "prefer not to answer", which was 4.7% of the U.S. sample and 10.0% of the Canada sample.

2.2. Measures

We measured *life satisfaction* using the 5-item Satisfaction with Life Scale (Diener et al., 1985). Participants responded to statements such as "I am satisfied with my life" on a 1 (*Strongly Disagree*) to 5 (*Strongly Agree*) scale. The measure was internally reliable, $\alpha = 0.89$.

We measured participants' *PEB frequency* by asking how often they engaged in 39 different pro-environmental behaviors (see Table 4 for a list of the bahaviors). Participants could indicate whether they engaged in the behavior *never* (1), *rarely* (2), *occasionally* (3), *usually* (4), or *always* (5). Participants could also indicate that they had no opportunity to engage in the behavior; we assigned these responses the same value as *never* responses (1).[1] This scale was internally reliable, $\alpha = 0.93$. Although self-report data of engagement in PEBs are imprecise indicators of objective behavior frequency (Kormos and Gifford, 2014), they are reliably related to objective behavior and they are appropriate for our purposes as they likely reflect individual variability in the subjective sense of having "done good" for the environment.

We measured perceptions of *ecological threat* with four items. Three items were taken from the New Ecological Paradigm scale (Dunlap et al., 2000): "The so-called ecological crises facing humankind has been greatly exaggerated" (reverse-scored), "Humans are severely abusing the environment", and "If things continue on their present course, we will soon experience a major ecological catastrophe". Participants responded to these items on a scale with response options ranging from 1 (*Strongly Disagree*) to 5 (*Strongly Agree*). An additional item asked participants to choose one of five statements that was closest to their "opinion on global warming (climate change)". Responses were assigned a value based on the degree of threat indicated in the statement. Participants who indicated that global warming "Is not a problem and does not require any action" were assigned a 1, indicating a low

[1] We also conducted analyses treating "no opportunity" responses as missing data thereby excluding participants who indicated "no opportunity" from the analysis. Those analyses replicated the results reported in this paper.

level of threat. Statements that did not indicate perceived threat, but also did not convey certainty of no threat were assigned the value 2—"More research is needed before action is taken" and "I don't know anything about this issue". The statements "It could be a serious problem, and we should take some action now" and "It is a serious problem, and immediate action is necessary" were assigned the values of 3 and 4, respectively.[2] The responses to these four items were z-transformed and averaged to create an index of ecological threat. The scale was internally reliable, $\alpha = 0.82$.

2.3. Demographic Controls

Gender. Participants indicated their gender by selecting *male* or *female*.

Age. Participants indicated their age by selecting one of nine age ranges: *under 19, 19 to 24, 25 to 34, 35 to 44, 45 to 49, 50 to 54, 55 to 64, 65 to 74, 75 and older*. Participant age was estimated using the midpoint of the age range they selected. For participants who selected *under 19* or *75 or older*, we estimated their ages as 18.9 and 75 years, respectively.

Income. Participants indicated their income by selecting one of 13 income ranges, on a scale from *<10,000* to *>150,000*. To estimate income, we used the midpoint of the selected range; we estimated income at $9999 and $150,001 when respondents chose *less than $10,000* and *greater than $150,000*, respectively. 7% of participants chose to not answer the question about income. Rather than eliminating those participants from the analysis, we chose to replace their income with the mean income for the rest of the sample, and to control for the missing income information by including a dummy variable (0 = answered the question, 1 = chose to not answer). Analyses were performed on the natural log of income (Kahneman and Deaton, 2010).[3]

Education. Participants indicated their highest level of education by selecting one of the following categories: Grade 8 or less, Some High School, High School Graduate, Some University/College, University/College Graduate, Some Graduate School, Graduate or Professional Degree. For analysis, we created two dummy variables–one indicating that the participant's highest level of education was an undergraduate degree, and one indicating that the highest level of education was a graduate or professional degree.

Region. Country was coded as U.S.A. = −1, Canada = 1. This coding allows for easier interpretation of main effects in regression analyses that included interactions between country and other variables. For the Canadian sample, dummy variables were created for being from Alberta, British Columbia, Ontario and Quebec. Other provinces and territories were combined into the reference category, as there were two few participants from each to justify examining them independently. In the U.S.A., following the four regions used by the United States Census Bureau (2013), we created dummy variables for the people from the Northeast, South, and West, with the Midwest serving as the reference category.

3. Results

We first ran parallel analysis on the two national datasets, and obtained similar results in both. Subsequently, we treated the samples as one dataset and tested for interactions between country and our key predictor variables (PEB, ecological threat). Zero-order correlations between study variables are presented in Table 2. We tested our hypotheses using a series of multiple linear regression models. Each model controlled for the effects of country, region, age, gender, the natural log of income, a dummy variable indicating that participants did not answer the question about income, and education (bachelor's degree, graduate degree). On their own, the controls predicted 10% of the variance in life satisfaction, $R^2 = 0.10$, $F(14,2206) = 16.81$, $p < 0.001$.

3.1. Hypotheses 1 and 2: PEB, Ecological Threat, and Life Satisfaction

To test Hypotheses 1 and 2, we examined pro-environmental behavior and ecological threat as predictors of life satisfaction in separate regression analyses (Models 1 and 2 in Table 3), and as simultaneous predictors (Model 3). In Model 1, PEB positively predicted life satisfaction, $b = 0.21$, 95% CI [0.15, 0.27], $SE = 0.03$, $\beta = 0.15$, $t(2205) = 7.15$, $p < 0.001$, $\Delta R^2 = 0.02$. In Model 2, ecological threat negatively predicted life satisfaction $b = -0.09$, 95% CI [−0.14, −0.05], $SE = 0.02$, $\beta = -0.09$, $t(2205) = -4.07$, $p < 0.001$, $\Delta R^2 = 0.01$. When PEB and ecological threat were included as simultaneous predictors of life satisfaction (Model 3), both were significant, and the effects for each were slightly stronger than when examined alone. PEB positively predicted life satisfaction, $b = 0.28$, 95% CI [0.22, 0.34], $SE = 0.03$, $\beta = 0.19$, $t(2204) = 8.97$, $p < 0.001$; ecological threat negatively predicted life satisfaction, $b = -0.16$, 95% CI [−0.20, −0.11], $SE = 0.02$, $\beta = -0.15$, $t(2204) = -6.75$, $p < 0.001$. These findings offer support for Hypotheses 1 (PEB positively predicts life satisfaction) and Hypothesis 2 (ecological threat negatively predicts life satisfaction).

To examine whether the relationships between PEB and life satisfaction, and ecological threat and life satisfaction differed by country, in Model 4 we added interactions terms for PEB × Country, and Ecological Threat × Country. Country did not interact with PEB to predict life satisfaction, $p = 0.77$; therefore, we can conclude that the positive relationship we observed between PEB and life satisfaction occurred across samples from both countries and was of a similar magnitude. Country did moderate the relationship between ecological threat and life satisfaction, $p = 0.012$. The negative relationship between ecological threat and life satisfaction was stronger in Canada ($\beta = -0.18$, $p < 0.001$) than in the U.S.A. ($\beta = -0.10$, $p = 0.002$), but was significant for both countries. These analyses offer support for Hypotheses 1 and 2 in both national samples.

3.2. Hypothesis 3: Does PEB Suppress the Negative Relationship Between Ecological Threat and Life Satisfaction?

We hypothesized that perceiving ecological threat would negatively predict well-being, but that ecological threat would also have a positive indirect relationship with well-being mediated by PEB. To test this hypothesis, we first examined whether perceptions of ecological threat predicted PEB. In a model with all controls, ecological threat predicted more frequent PEB, $b = 0.24$, 95% CI [0.21, 0.27], $SE = 0.015$, $\beta = 0.312$, $t(2205) = 15.53$, $p < 0.001$. When we added an additional term testing the interaction between country and perceived threat, the interaction was not significant, $p = 0.71$; in other words, there was no evidence that the relationship between ecological threat and PEB differed between countries.

As depicted in Fig. 1, the data supported our hypothesis and proposed mediation model. Perceived ecological threat had a direct negative relationship with life satisfaction, but was also positively related to PEB, which was positively associated with life satisfaction. To more formally test whether PEB mediated a positive relationship between ecological threat and life satisfaction, we used the PROCESS bootstrapping macro (Hayes, 2012). This approach considers a mediated relationship as statistically significant if the 95% bootstrapped confidence interval for the mediated effect does not contain zero. In our case, the mediated relationship was significant, $b = 0.07$, $SE = 0.001$, 95% CI [0.05, 0.08]. These findings are consistent with the idea that perceiving ecological threat has a negative direct effect on life satisfaction, and

[2] Treating the global warming item as a continuous variable is not ideal; however, analyses that are more conservative (e.g., dummy code for "It is a serious problem" vs. all other responses) produce the same findings. Furthermore, results reported in this paper are replicated when the global warming item is excluded from the ecological threat composite score.

[3] Analyses that exclude participants who did not provide their income replicated results reported in this paper. Similarly, results were similar if we did not log-transform income, again suggesting the current results are robust to the inclusion of various controls.

Table 2
Correlations between perceived ecological threat, pro-environmental behavior, life satisfaction, and demographic characteristics.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
1. Ecological threat																
2. PEB frequency	0.32															
3. Life satisfaction	−0.08	0.18														
4. Age	−0.04	0.04	0.03													
5. Gender[a]	0.12	0.08	0.04	−0.12												
6. Alberta	−0.01	0.04	0.00	−0.01	0.05											
7. British Columbia	0.07	0.08	−0.06	0.10	0.01	−0.10										
8. Ontario	0.03	0.09	−0.05	−0.01	−0.01	−0.13	−0.15									
9. Quebec	0.10	−0.01	0.07	−0.02	−0.01	−0.12	−0.14	−0.17								
10. Northeastern USA	0.03	−0.07	−0.01	−0.05	0.02	−0.09	−0.11	−0.13	−0.13							
11. Southern USA	−0.10	−0.10	0.01	−0.05	−0.04	−0.13	−0.16	−0.19	−0.18	−0.14						
12. Western USA	−0.08	0.03	0.02	−0.01	−0.01	−0.10	−0.11	−0.14	−0.13	−0.10	−0.15					
13. Country[b]	0.16	0.13	−0.01	0.06	0.04	0.27	0.32	0.38	0.36	−0.35	−0.49	−0.36				
14. Income log	−0.03	0.14	0.27	−0.12	−0.01	0.06	−0.01	0.02	−0.08	0.01	0.04	0.02	−0.03			
15. Income not reported	−0.03	0.01	0.06	0.02	0.09	0.02	0.03	0.04	0.02	−0.04	−0.04	−0.03	0.10	0.08		
16. Bachelor's degree	0.04	0.11	0.05	−0.11	0.00	0.03	−0.02	0.04	0.01	−0.04	0.03	−0.00	0.03	0.18	0.01	
17. Graduate degree	0.00	0.03	0.06	−0.02	−0.02	−0.05	−0.04	−0.02	−0.05	0.04	0.09	0.03	−0.12	0.20	−0.04	−0.29

Note. $N = 2220$. $|r| > 0.04$ has $p < 0.05$; $|r| > 0.05$ has $p < 0.01$; $|r| > 0.07$ has $p < 0.001$.
[a] Male = 1, female = 2.
[b] USA = −1, Canada = 1.

this relationship is suppressed by an indirect positive effect of perceived threat on life satisfaction mediated by PEB.

3.3. Hypotheses 4–6: Analysis of Specific Behaviors

We next examined the relationship between life satisfaction and each of the 39 behaviors separately, controlling for perceived ecological threat and the control variables as in the main regression analysis (Model 3 in Table 3). As shown in Table 4, the relationship was significantly positive for 37 behaviors, and non-significant for 2. Overall, this finding suggests that the positive relationship between PEB and life satisfaction is detectable across a wide range of PEBs, and thus not limited to any particular type(s) of behavior.

Despite the evidence for a positive relationship with life satisfaction across behaviors, there was also variability in the size of this relationship, with βs ranging from 0.02 to 0.14. Hypotheses 4–6 predict that this variance is not random but systematic. Hypothesis 4 predicts that the relationship between PEB and life satisfaction is larger for behaviors that have greater direct costs (in financial cost, time and effort required). Hypothesis 5 predicts that the relationship will be larger for easily observed behaviors than for more private ones. Hypothesis 6 predicts that the relationship between PEB and life satisfaction is larger for behaviors higher in socialness. To test these hypotheses, seven people (two of the authors of this paper and five undergraduate research assistants) rated the extent to which the 39 PEBs involved direct costs, were observable by others, and provided opportunities for social interaction and building of relationships. Each rater independently responded to seven items of interest for each behavior. For each item, we averaged across raters. Inter-rater reliability was good, with all seven dimensions having Intraclass Correlation Coefficients > 0.78.

Using 1–5 scales, we rated behaviors in terms of their short-term and long-term financial implications (scale ranging from *saves a lot of money in the short term/over the long term* to *costs a lot of money in the short term/over the long term*), and their implications for people's time (*saves a lot of time* to *requires a lot of time*). We rated the effort required to perform the behavior using a 1–4 scale ranging from *does not require any effort* to *requires a high degree of effort*. To create a single index of costs, we averaged across the *z*-transformed ratings for short-term financial costs, long-term financial costs, time, and effort, with higher scores indicating PEBs with higher direct costs overall. We also rated the likelihood that other people would observe the behavior using a 1–5 scale (*not at all likely* to *highly likely*). Finally, we rated the likelihood that the behavior would involve or lead to social interactions, and the likelihood that the behavior would build social relationships, using a 1–5 scale (*not at all likely* to *highly likely*). We averaged the *z*-transformed ratings for social interaction and building relationships to create a single index of the socialness of the behavior.

Using the β's for the relationships between frequency of each of the 39 behaviors and life satisfaction, we conducted a behavior-level analysis, trying to predict β for each behavior based on how the behaviors were rated in terms of direct costs, observability, and socialness. The β's for each behavior, and ratings of direct costs, observability, and socialness are presented in Table 4, with the behavior items ordered by size of their relationship with life satisfaction. As shown in Fig. 2, the relationship between PEB and life satisfaction was larger for behaviors that were rated as having higher direct costs ($r = 0.74$, $p < 0.001$), for behaviors rated as more observable ($r = 0.37$, $p = 0.02$), and for

Table 3
Life satisfaction as a function of pro-environmental behavior and perceived ecological threat.

Predictors	Model 1		Model 2		Model 3		Model 4	
	B(*SE*)	β	*B*(*SE*)	*B*	*B*(*SE*)	β	*B*(*SE*)	β
PEB	0.21 (0.03)	0.15**			0.28 (0.03)	0.19**	0.27 (0.03)	0.19**
Ecological threat			−0.09 (0.02)	−0.09**	−0.16 (0.02)	−0.15**	−0.16 (0.02)	−0.15**
Country × PEB							−0.01 (0.03)	−0.03
Country × eco. threat							−0.06 (0.02)	−0.05*
ΔR^2		0.02**		0.01**		0.04**		0.003**
Total R^2		0.12**		0.10**		0.14**		0.14**

Note. All models control for age, gender, income, education, country and region. For Models 1–3, ΔR^2 is relative to the model with controls only. For Model 4, the ΔR^2 is in comparison to Model 3.
* $p < 0.05$.
** $p < 0.001$.

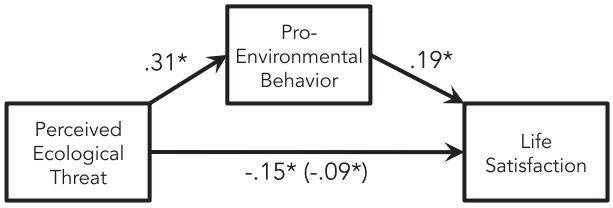

Fig. 1. Pro-environmental behavior mediated a positive relationship between perceived ecological threat and life satisfaction. Coefficients in figure are standardized. *Indicates $p < 0.001$. Coefficient in brackets is the total relationship between perceived ecological threat and life satisfaction. Analyses control for age, gender, income, education, country and region.

behaviors rated as more social ($r = 0.50$, $p = 0.001$). Thus, Hypotheses 4, 5, and 6 all received some support. As ratings of direct costs, observability, and socialness were correlated with each other, we also examined the relationships between PEB and life satisfaction when social interaction, direct costs, and observability were examined simultaneously. Direct costs remained a significant predictor ($\beta = 0.71$, $p < 0.001$) but social interaction was not a significant predictor ($\beta = 0.17$, $p = 0.37$) and neither was observability ($\beta = -0.13$, $p = 0.46$). Overall then, there is some evidence for the role of all three dimensions (i.e., direct costs, socialness, and observability); however, for the behaviors examined in this study, direct costs was a much better predictor of the size of the relation between PEB and life satisfaction than socialness or observability.

4. Discussion

Using representative samples from Canada and the United States, we found that engagement in pro-environmental behavior, like other forms of prosocial behavior, is associated with greater subjective well-being. Results were similar in both national samples and remained while controlling for demographic variables, including age, gender, income, and education. Notably, our examination looked at engagement in a wide range of PEBs and found positive associations with life satisfaction for nearly every form (37 of 39 behaviors). The more frequently the participants reported engaging in the behavior, the higher life satisfaction they reported. None of the behaviors were negatively related to well-being.

Although PEBs in general were positively related to well-being, some behaviors were more strongly related to well-being than others. Our study is the first to test for systematic variance in the size of the PEB-well-being relationship depending on the specific behavior. In particular, we found that the relationship between PEB and well-being was stronger for behaviors with higher direct costs in time, money, and effort, compared to behaviors with no costs or with benefits in terms of time or money saved. Our rating of the direct costs of PEBs predicted more than half of the variance in the size of the relationship between a particular PEB and life satisfaction. This finding dovetails with the

Table 4
Behavior-level analysis of the relationship between pro-environmental behavior (PEB) and life satisfaction (LS), and ratings of direct costs, observability, and socialness.

Pro-environmental behavior item	PEB → LS	Direct costs	Observability	Socialness
Participate in local environmental activities	0.141*	1.55	1.53	2.03
Buy food at a farmer's market	0.133*	0.76	0.65	0.64
Talk to children about environmental issues	0.131*	0.88	1.00	1.78
Buy locally produced foods	0.130*	1.78	−0.04	0.46
Buy energy-efficient appliances	0.128*	0.30	−0.04	−0.60
Make your own products instead of purchasing	0.124*	1.37	0.13	0.02
Talk to children about how food is grown	0.124*	0.81	1.53	1.84
Attend pro-environmental meetings	0.123*	1.74	0.83	2.15
Buy environmentally friendly soaps or cleaners	0.119*	0.65	−0.74	−0.79
Buy organic food	0.119*	1.02	0.13	0.02
Eat a diet based on organic, local, or free-range food	0.118*	2.01	1.00	0.71
Trade or share products with others rather than buy	0.115*	−0.52	1.18	1.90
Buy products made from recycled materials	0.109*	0.03	−0.39	−0.41
Avoid excess packaging in purchases	0.102*	−0.24	−0.92	−0.73
Compost garden or kitchen waste	0.102*	0.63	−0.57	−0.35
Grow your own food	0.102*	1.34	1.53	0.84
Walk or cycle	0.102*	0.12	1.70	1.14
Support pro-environmental candidates in elections	0.101*	0.32	−1.27	0.40
Buy an efficient vehicle	0.096*	0.22	0.30	−0.23
Buy high-efficiency light bulbs	0.094*	0.05	−0.39	−0.98
Use reusable bag when shopping	0.092*	−0.46	0.83	−0.35
Turn off tap when soaping up	0.090*	−0.87	−0.92	−0.79
Turn off tap when brushing teeth	0.089*	−0.57	−1.44	−1.04
Eat a vegetarian diet	0.087*	−0.04	1.35	0.65
Minimize number of baths or showers	0.083*	−1.47	−1.27	−0.79
Reduce hot water temperature	0.079*	−1.32	−1.27	−0.85
Shut off electrical appliances when not in use	0.079*	−0.59	−0.74	−0.97
Minimize water use in yard or garden	0.075*	−1.24	0.65	−0.41
Reduced home air-conditioning use	0.071*	−1.46	−1.09	−0.85
Fix something rather than buy new	0.070*	0.11	−0.74	−0.16
Turn off tap when washing dishes	0.067*	−0.59	−0.92	−0.98
Reuse paper or glass	0.066*	−0.82	−0.39	−1.04
Hang clothes to dry instead of using dryer	0.061*	−0.09	0.13	−0.66
Buy used products instead of new ones	0.052*	−0.80	−0.74	0.46
Minimize use of home heating	0.050*	−1.64	−1.09	−0.73
Turn off lights when not in use	0.050*	−1.44	0.13	−1.10
Use recycling bins for paper, cardboard, cans, glass	0.046*	−0.16	0.30	−0.54
Use public transit or carpool	0.035	−0.14	1.70	1.33
Run washer/dryer only when full	0.020	−1.23	−1.62	−1.04

Note. Values in the first column represent the standardized Beta coefficients for the relationship between frequency of engaging in each PEB and LS. Ratings of direct costs, socialness, and observability are presented as z-scores.
* $p < 0.05$.

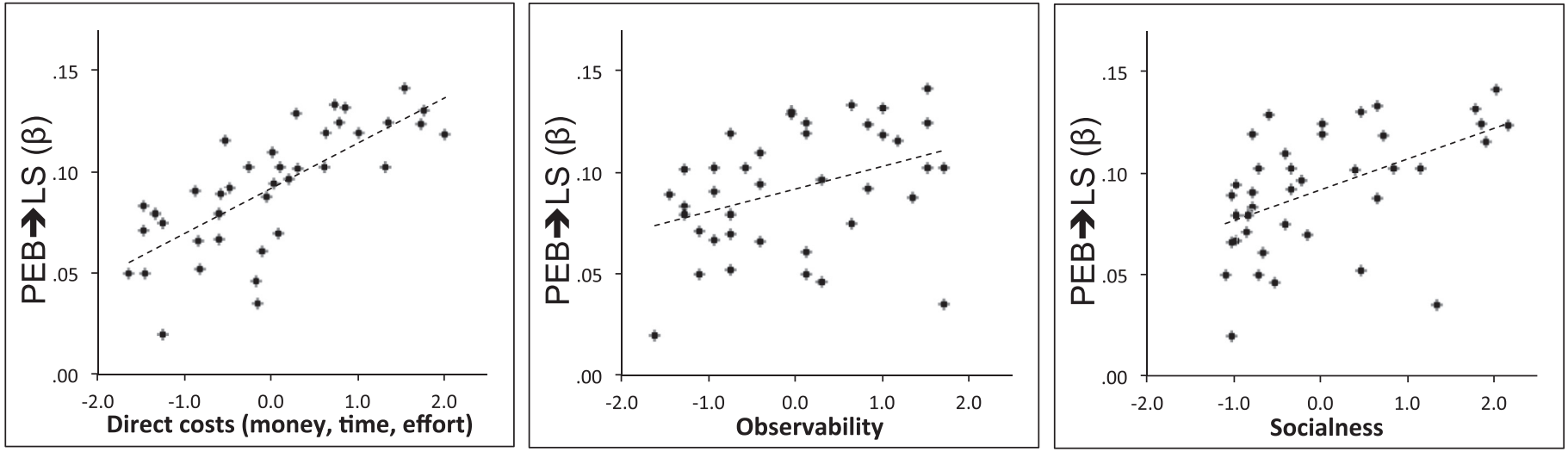

Fig. 2. Scatterplots demonstrating the association between the size of the relationship (β) between individual pro-environmental behavior (PEB) items and life satisfaction (LS) on the *y*-axis, and ratings of direct costs, observability and socialness (as z-scores) on the x-axes.

idea that PEBs contribute to well-being, at least in part, because they are behaviors that require *giving* of one's resources for the benefit of others. Our findings add to a growing body of evidence suggesting that humans experience higher subjective well-being when they engage in behaviors that they perceive as benefitting others (e.g., volunteering, engaging in random acts of kindness, and spending money on others).

Other reasons why PEB might enhance well-being were not as strongly supported by the data. The socialness and observability of behaviors did predict the size of the relationship between PEB and life satisfaction, but direct costs was a much stronger predictor. Furthermore, socialness and observability did not predict the size of the relationship when controlling for direct costs. On the other hand, even when controlling for observability and socialness, direct costs continued to account for half the variance in the size of the relationship between PEB and life satisfaction. In sum, our results lend more support to the idea that PEBs are good for well-being, at least in part, because they involve giving of one's resources in a way that benefits others, rather than what PEB might do for one's reputation or social connections. Of course, evidence that acting on behalf of others at some cost to the self predicts well-being is not in itself evidence that such behaviors were altruistically motivated. Thus, our results are also consistent with warm-glow perspectives that suggest people might engage in PEB to feel good about "doing the right thing" and its implications for self-image, pride, guilt avoidance, value-consistency, or social acceptance.

Our study was also the first to include perceived ecological threat in an analysis of the relationship between PEB and well-being. Although not a sufficient cause in itself, the recognition of environmental problems is a predictor of attempts to act pro-environmentally (Bamberg and Möser, 2007; Johnson and Frickel, 2011). Like prior research, we found that perceived ecological threat predicted more frequent engagement in PEBs. We also predicted that ecological threat would be associated with lower well-being because it signals the likely suffering of the self, loved ones, future generations and other species. Consistent with expectations, we found that the perception of ecological threat negatively predicted life satisfaction. However, this effect was suppressed by higher levels of PEB, which positively predicted well-being. In sum, results are consistent with the idea that perceiving ecological threat harms well-being, but it also motivates behavior that partially reduces the overall negative effect on well-being.

4.1. Limitations and Future Directions

Although results are consistent with the hypothesized positive effect of PEB on well-being, it is important to remember that, as in prior research, our data are cross-sectional. Controlling for multiple demographic variables, as we did, helps to rule out many third-variable explanations, but cannot rule out the possibility that well-being caused more frequent engagement in PEB (rather than vice versa). Longitudinal and experimental evidence for the well-being effects of *other* (non-environmental) types of prosocial behavior suggests that our interpretation is highly plausible (Dunn et al., 2014); however, there are no experimental studies of PEB on well-being reported in the literature. One longitudinal study does show that PEB engagement can predict changes in well-being across time: Pillemer et al. (2010) found that engaging in environmental volunteerism in 1974 predicted fewer depressive symptoms in 1994, controlling for depressive symptoms in 1974. Future research should incorporate experimental and longitudinal methods to both test for causal evidence and to examine the possible recursive relationships between PEB, life satisfaction, and perceptions of ecological threat.

Consistent with prior research demonstrating that costly giving leads to greater well-being than non-costly giving (Aknin et al., 2012), we found that the PEBs with higher direct costs were more strongly related to well-being. In our study, it might also be the case that more costly behaviors were seen as more efficacious (having a bigger impact), which is also known to increase the positive emotional effects of prosocial behavior (Aknin et al., 2013a, 2013b). Although both interpretations are consistent with the idea that PEBs promote well-being because they are actions that benefit others, future research might disentangle whether the patterns we observed are due to costs per se, or whether costs are in part a proxy for how much of a difference a person believes they are making (Binder and Blankenberg, 2017).

We did not measure participants' motivations for engaging in PEB. Future research could explore whether the well-being effects of PEB, and the effects of the direct costs of PEB, are dependent on whether PEB is truly altruistically motivated to benefit other people or the environment, or whether it is driven by motivations such as cost savings, a warm glow, or pressure to conform to pro-environmental norms (Konrath et al., 2012; Wang and Tong, 2015; Wiwad and Aknin, 2017). PEBs might be more likely to contribute to well-being they more that result from self-determined ("intrinsic") motivations, emerging from one's guiding principles and core values (see Hill and Howell, 2014; Ryan and Deci, 2000; Weinstein and Ryan, 2010). Conversely, PEBs driven by more extrinsic concerns (e.g., costs savings) might be less likely to contribute to well-being. As PEBs are predicted by both biospheric and altruistic values (Stern et al., 1999), future research might explore the possibility that the PEB-well-being relationship is stronger for individuals (or cultures) with high altruistic or biospheric values (but see Aknin et al., 2017).

Future research might also consider investigating the point at which direct costs outweigh the positive well-being consequences of engaging in PEB, assuming that point exists. Many PEBs are subject to a budget constraints (in terms of money, effort and time, see Welsch and Kühling, 2011), and thus at high levels of cost, the negative effect of alternatives foregone might dominate positive well-being consequences of sacrificing one's resources for the environment. Researchers might also consider what psychological and contextual factors might influence the level of costs at which that point of inflection occurs. Additional research could focus on the potential impact of other costs that we did not examine. For example, there may be "comfort costs" when you turn down the thermostat, and potential "quality" costs when considering the adoption of green technology (e.g., Axsen et al., 2009). There might also be social costs associated with some PEBs, such as being stigmatized for choosing to eat a vegetarian diet or for being an environmental activist (Bashir et al., 2013). It is an open empirical question whether these types of costs would enhance the positive relationship between PEB and life satisfaction. Social costs in particular might be less likely to promote well-being, given the centrality of social connection for well-being and the pain caused by rejection (Williams and Nida, 2011).

Aside from our study and a few others (van der Linden, 2014; Greitemeyer, 2013), there is little empirical work on the well-being costs of anticipating negative environmental outcomes. There is some evidence that concern over different types of ecological threats is differentially related to well-being, and that some concerns might even have a positive relationship with well-being (Ferrer-i-Carbonnel and Gowdy, 2007). Future research might further explore this possibility that some perceived ecological threats are more likely to undermine well-being than others. Researchers could investigate the multiple reasons why perceiving ecological threat might influence well-being, as ecological threat potentially represents a threat to self, to family and loved ones, to future generations, to humans as a species, or to other species. Future research might attempt to replicate and extend our finding that PEB can offer people a way to cope with the well-being consequences of ecological threat, as well as explore other potential ways of coping.

4.2. Implications and Conclusions

Readers should not interpret the idea that engaging in PEB is good for subjective well-being to mean that people will want to voluntarily do what is necessary to address climate change and other environmental issues without policy or social changes. First, our perspective (in

contrast to warm-glow perspectives, e.g., Andreoni, 1990; Hartmann et al., 2017) does not assume that people are engaging in PEB because they believe it will provide them higher subjective well-being. Second, a large body of research suggests that people do not often accurately predict the well-being consequences of their behaviors (Kahneman et al., 1997; Wilson and Gilbert, 2003). In the case of prosocial behavior in particular, people tend to underestimate the positive effects on well-being (Dunn et al., 2008, but see Harris, 1977), and there is some evidence that such "decision errors" exist for PEBs as well (Welsch and Kühling, 2011). Therefore, it seems likely that people will underestimate the positive well-being consequences of engaging in PEB, perhaps even anticipating *harm* to well-being (Steg and Gifford, 2005). For those reasons, and the obvious evidence that the emotional rewards of PEB have not yet driven people to change their individual consumption patterns to a degree that is sufficient to mitigate climate change and other environmental problems, the need for further policy and social changes is apparent. As suggested by our findings, adopting policies that encourage and enable people to undertake PEBs will not just improve the environment, but might also contribute to subjective well-being.

Further, we speculate that attempts to encourage pro-environmental behavior that focus on positive consequences for others might be more likely to provide a greater boost to well-being than attempts that focus on benefits for the self (e.g., financial savings). In that sense, focusing on other-oriented implications of PEB might provide people with the psychological resilience (i.e., emotional well-being) needed for successful transition to a sustainable society. Future research should explore these potential policy implications of our findings, for example by investigating whether PEB that results from an environmental policy framed in term of helping leads to more emotional rewards than PEB that results from an environmental policy framed in egoistic terms (e.g., cost savings).

Of course, the subjective well-being of contemporary humans need not (and should not) be the primary motivator for environmental policy and action. However, as pointed out by research and theorizing from a "sustainable happiness" perspective (O'Brien, 2008), our research suggests that encouraging PEB and human well-being need not be seen as incompatible goals. Such findings contradict the common assumptions in environmental policy design that any policy that involves some costs to people in terms of money, time or effort will necessarily decrease well-being. More generally, our results point to the possibility that lifestyle changes that are likely necessary for a successful transition are not necessarily the threats to well-being that many researchers, policymakers and other stakeholders often assume. Rather these lifestyle changes might enhance well-being, particularly if the behavior is understood as "doing good" for others. Acting in ways that protect the environment might itself serve as an emotional resource in times of ecological threat, despite the costs of these behaviors in time, money, and effort.

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