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Most People Think They Are More Pro-Environmental than Others: A Demonstration of the Better-than-Average Effect in Perceived Pro-Environmental Behavioral Engagement

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ABSTRACT

People tend to perceive themselves as better than average in various contexts. In this article I test if the better-than-average effect (BTAE) also holds for pro-environmental behavioral engagement. Experiment 1 supported that the majority of participants report to be more pro-environmental than others, using a large representative sample. Experiment 2 validated these findings in 3 additional cultures (United States, United Kingdom, and India) and showed that BTAE held for both abstract (other Americans) and concrete (my friends) comparisons. Experiment 3 found that participants overestimated both how “much” and how “often” they engage in pro-environmental actions. Finally, Experiment 4 found weak support for the hypothesis that inducing BTAE are inhibiting future pro-environmental behaviors.



Introduction

Climate change is one of the most severe and alarming threats of our time (IPCC Intergovernmental Panel on Climate Change, 2018). As a means to mitigate climate change, individuals’ accumulated pro-environmental behaviors are of significance (Dietz, Gardner, Gilligan, Stern, & Vandenbergh, 2009). Yet, numerous psychological barriers are impeding pro-environmental behaviors (Gifford, 2011). One such potential barrier is the self-serving bias, causing overestimated beliefs about people’s abilities and underestimated beliefs about personal risks (Slovic, Finucane, Peters, & MacGregor, 2004). Although widely studied and discussed (Clayton et al., 2015; Gifford, 2011; Hoorens, 1993; Sharot, 2011, for review), there is no empirical study (that I know of) testing if the self-serving bias is, in fact, making people overestimate their pro-environmental engagement. And if so, are self-serving biases also a barrier for undertaking pro-environmental behaviors? This article tests one form of self-serving bias: the better-than-average effect (BTAE), showing that people overestimate themselves compared with others (Alicke & Govorun, 2005). The overarching research questions are as follows: Do people overestimate their own pro-environmental

engagement compared to others? If so, does the BTAE also undermine antecedents of pro-environmental behaviors?

There are various forms of self-serving biases. There is the optimism bias, defined as when people’s expectations are greater than the objective outcomes. The optimism bias has been shown to falsely inflate people’s expected job achievements and underestimate risks about getting cancer (Sharot, 2011; Weinstein, 1989). Put differently, the optimism bias is causing people to both overestimate the likelihood of positive events and underestimate the likelihood of negative events (Weinstein, 1980). Similarly, self-serving biases also cause people to use positive information more often than negative information when updating their knowledge (Sharot, 2011). Applied to climate change mitigation, research has reported that skeptics about climate change are more influenced by unexpected “good news” than “bad news” (Sunstein, Bobadilla-Suarez, Lazzaro, & Sharot, 2006).

The BTAE (Alicke & Govorun, 2005) is a self-serving bias making people overestimate their abilities in relation to others. For example, when asking students about their driving abilities, 77% of Swedish American and 88% of U.S. American students perceived themselves as safer than the mean driver

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(Svenson, 1981). The BTAE has been demonstrated in a number of behaviors, showing that people overestimate their teaching abilities and athletic abilities, as well as their leadership skills and social skills (Cross, 1977; see Alicke & Govorun, 2005, for a review). The BTAE is skewing perceived traits—for example, making people rate themselves as more honest, persistent, and original than average; they also make people overestimate their likelihood of being right (Hoorens, 1993; Hoorens & Buunk, 1992; Soll & Klayman, 2004).

Although the outcome variables in previous studies on the BTAE are indeed important, the lack of research on how self-serving biases might limit climate change mitigation is noteworthy, given the environmental problems of our times. There are at least two reasons to test if people overestimate their own contributions to climate change mitigation: (a) to assess if people indeed *do* overestimate their own pro-environmental engagement compared with others, and (b) if such overestimations are *undermining* pro-environmental behaviors.

Based on research suggesting that pro-environmental behaviors are generally perceived as appropriate (e.g., Steg, Bolderdijk, Keizer, & Perlaviciute, 2014), and studies showing that people tend to perceive themselves as better than average on desirable behaviors (Alicke, 1985), it is hypothesized that most people will perceive themselves as more pro-environmental than others.

The present study is structured as follows: Study 1 recruits a representative sample ($n=2,635$) from Sweden, testing if people are influenced by the BTAE when evaluating their own pro-environmental behaviors. Study 2 seeks to validate the BTAE of pro-environmental behaviors in three countries (India, United Kingdom, and United States; $n_{\text{total}} = 513$). Study 3 ($n=401$) replicates the BTAE using refined measurements. Finally, Study 4 ($n=493$) tests if the BTAE serves as a psychological barrier for people's pro-environmental obligation and intentions.

Study 1: Do people overestimate their own pro-environmental engagement?

Given that the frequency of abilities and actions are normally distributed in the population, the median in an unbiased dataset must correspond to the “average” in a normally distributed curve. One method to assess the BTAE is therefore to compare people's self-rated behaviors to a normally distributed curve. Negatively skewed data ($\tilde{x}_{\text{obtained}} > \tilde{x}_{\text{expected}}$) would support the

BTAE, whereas normally distributed data ($\tilde{x}_{\text{obtained}} = \tilde{x}_{\text{expected}}$) would support the null hypothesis (Weinstein, 1989).

Hypothesis

Based on research suggesting that pro-environmental behaviors are perceived as appropriate (e. g., Steg et al., 2014) and that people tend to perceive themselves as better than average on desirable behaviors (Alicke, 1985), it is hypothesized that most people will perceive themselves as more pro-environmental than others.

Method

In collaboration with the Laboratory of Opinion Research, 2,911 respondents from a representative Swedish panel were recruited to an online survey. There were 276 respondents excluded because of missing data, leaving 2,635 respondents (47.6% female, 52.4% male; age: 9.7% = <30, 16.5% = 30–39, 19.4% = 40–49, 20.5% = 50–59, 21.1% = 60–69, 12.8% = 70+) for the main analysis. Based on Weinstein (1989), the BTAE was assessed by one self–others comparison question: “Compared to Swedes, how often/how much would you say you engage in pro-environmental behaviors?” measured on a 7-point Likert scale of 1 (*much less than others*), 2 (*moderately less than others*), 3 (*slightly less than others*), 4 (*about the same as others*), 5 (*slightly more than others*), 6 (*moderately more than others*), and 7 (*much more than others*).

Results and discussion

The distribution of participants' self-rated pro-environmental behavior can be seen in Table 1. In support of the BTAE of pro-environmental behaviors, the obtained median ($\tilde{x}_{\text{obtained}} = 5$) was above the expected median ($\tilde{x}_{\text{expected}} = 4$). The majority of respondents perceived themselves as “slightly more” pro-environmental than other Swedes. More specifically, 51.3% of the sample perceived themselves as above the expected median, whereas 8.6% perceived themselves as below the expected median. These data support the BTAE of pro-environmental behaviors, showing that most participants perceived themselves as more pro-environmental than others.

Taken together, Study 1 adds to research on the BTAE (Alicke & Govorun, 2005) by showing that, in general, people perceive themselves as more

Table 1. Descriptive statistics for the better-than-average effect in self-rated pro-environmental behaviors in a large scale representative Swedish sample.

	Estimated position in sample						
	Much less	Moderately less	Slightly less	About the same	Slightly more	Moderately more	Much More
Swedish sample ^a	1.0%	2.5%	5.1%	40.1%	26.1%	19.3%	5.9%
"Compared to other people living in Sweden"	8.6% < expected median			51.3% > expected median			

^a $n = 2,635$.

pro-environmental than the average person, hence suggesting that people in general are holding over estimated beliefs about their own contribution to climate change mitigation. It should be noted that the effects in Study 1 were weaker than in past research (e.g., Svenson, 1981). Furthermore, in terms of external validity, it is unclear if and to what extent the BTAE of pro-environmental behaviors could be generalized across cultures. Past research has observed cultural differences with regard to the BTAE (Sedikides, Gaertner, & Vevea, 2005; Tam et al., 2012). Therefore, Study 2 tests the BTAE of pro-environmental behaviors in three additional countries: India, United Kingdom, and United States.

In Study 1, the BTAE was assessed by a single-item question: "Compared to Swedes, how often/how much would you say you engage in pro-environmental behaviors?" This method could be criticized as the following: (a) Participants are comparing themselves to an abstract reference group (Swedes), and (b) participants are assessing an abstract set of behaviors (pro-environmental behavior). Study 2 was therefore designed to explore these issues (and thus test the boundaries of the BTAE) by (a) including a less abstract reference group (your friends), and (b) including 10 predefined pro-environmental behaviors or open-ended questions.

Study 2: Testing the BTAE of pro-environmental behaviors in three cultures

The main aim of Study 2 is to validate the BTAE of pro-environmental behaviors in three countries (India, United Kingdom, and United States). Study 2 also refines Study 1 by controlling for the reference group and predefined versus open-ended questions on pro-environmental behaviors.

Method

There were 571 individuals recruited to an online survey using Amazon's Mechanical Turk (MTurk). Fifty-eight individuals were excluded because of invalid self-reported behaviors, resulting in a final sample of

513 participants located in India ($n = 196$), the United Kingdom ($n = 193$), and the United States ($n = 124$). MTurk is an online marketplace where employers are free to choose among various online tasks described by content and payment. Using MTurk, participants' geographical locations were restricted to collect data from the three study countries. All participants actively volunteered and signed up to conduct "a survey about your behavior"; they were informed about the length, content, and payment for conducting the task. All participants were given the opportunity to contact the author and were informed that their participation would be treated anonymously and confidentially, their information would be used only for research purposes, and they had the right to end their participation.

The BTAE was assessed by the same self-others comparison question as in Study 1, with modifications of the reference group (i.e., "compared to people living in ... India; ... United Kingdom or ... the United States, or ... compared to your friends"). The self-others comparison question was assessed for both "other Americans" and "your friends" in the U.S. American sample. To specify the assessments of pro-environmental behaviors, participants in the Indian sample were asked to report their pro-environmental engagement using open-ended questions. For participants in the U.K. and U.S. samples, pro-environmental behavior was assessed by the following 10 predefined behaviors, rated from 1 (*never*) to 5 (*always*): Buy products with a green mark, Turn off faucet when brushing teeth, Take own bag for shopping, Turn off the lights when leaving a room, Turn off the faucet when shampooing hair, Switch off air conditioner frequently, Keep the temperature moderate, Buy items from secondhand shops, Take old items to secondhand shops, Recycle plastic bottles (see Whitmarsh & O'Neill, 2010). These data enabled an alternative test of the BTAE: comparing participants' self-rated behaviors to the assessed behavior of the reference group. That is, in addition to assessing the BTAE via the self-others comparison question, the predefined items assessed on which pro-environmental behaviors people perceive themselves as better than average.

Table 2. Descriptive statistics for the better-than-average effect in self-rated pro-environmental behaviors recruiting participants from India, the United Kingdom, and the United States.

	Estimated position in sample						
	Much less	Moderately less	Slightly less	About the same	Slightly more	Moderately more	Much More
Total sample ^a "Compared to other people living in ..."	0.6%	2.1%	6.2%	15.8%	31.8%	34.1%	9.4%
India sample ^b "Compared to other people living in India ..."	0%	8.9% < Median 2.0%	3.6%	8.7%	32.7%	75.3% > Median 41.8%	11.2%
UK sample ^c "Compared to other people living in United Kingdom ..."	0.5%	5.6% > Median 2.1%	5.2%	20.2%	32.6%	85.7% > Median 33.2%	6.2%
American sample ^d "Compared to other people living in America ..."	1.6%	7.8% < Median 2.4%	12.1%	20.2%	29.0%	72.0% > Median 23.4%	11.3%
		16.1% < Median				63.7% > Median	

^a*n* = 513.^b*n* = 196.^c*n* = 193.^d*n* = 124.

Results and discussion

First, when analyzing the self–others comparison question, the obtained median for the total sample ($\tilde{x}_{\text{obtained}} = 5$), as well as for the Indian sample ($\tilde{x}_{\text{obtained}} = 6$), the U.K. sample ($\tilde{x}_{\text{obtained}} = 5$), and the U.S. American sample ($\tilde{x}_{\text{obtained}} = 5$) was above the expected median ($\tilde{x}_{\text{expected}} = 4$). The percentage of people rating their own pro-environmental engagement as above average was 75.3% in the total sample (85.7% in the Indian sample, 72% in the U.K. sample, and 63.7% in the U.S. American sample). These data validate the BTAE of pro-environmental behaviors in three countries (see Table 2).

To test if the BTAE of pro-environmental behaviors was affected by reference group (Alicke & Govorun, 2005), two groups were compared ("other Americans" and "my friends") in the U.S. American sample. Results showed that the BTAE of pro-environmental behavior was supported and of similar effect in both reference groups (see Table 3). This suggests that the BTAE of pro-environmental behaviors holds for both abstract and more concrete comparisons.

As an alternative means to test the BTAE of pro-environmental behaviors, participants' self-rated behaviors were compared to the reference group's behaviors on the 10 predefined pro-environmental behaviors. Results supported the BTAE by a medium-to-large effect size (Cohen's $d = 0.63$), showing that people perceived themselves as more engaged in pro-environmental behaviors than others. Moreover, when assessing each of the 10 items, nine of 10 pro-environmental behaviors showed positive effect sizes (range = 0.13–0.78; see Table 4).

Finally, a content analysis of the qualitative data from the Indian sample was conducted. Results showed that the five most frequently reported pro-environmental behaviors were "to plant a tree" (reported by 35.7% of participants), reduce or avoid plastics (26.5%), avoid littering (12.8%), take sustainable transportation (11.2%), and conserve water (11.2%). Other behaviors mentioned by less than 10% of the respondents were conserve energy (8.2%), participate in eco-consumption (5.6%), recycle (5.1%), reduce pollution (4.1%), educate others (3.6%), protect wildlife (2.6%), buy organic food (2.6%), avoid chemicals (2%), reduce consumption (2%), reduce food waste (1%), use fewer tree products (1%), engage in pro-environmental politics (1%), buy local food (0.5%), don't cut down trees (0.5%), reduce meat consumption (0.5%), reduce paper usage (0.5%), eat less (0.5%), do not use firewood when cooking (0.5%), and use lighting instead of firecrackers during traditional festivities (0.5%).

In sum, Study 2 supported and validated the BTAE of pro-environmental behaviors across countries and behaviors. The effect was supported in India, the United Kingdom, and the United States for nine of 10 pro-environmental behaviors and for both abstract (other Americans) and more concrete (my friends) reference group. Results showed that the BTAE was strongest in India (85.7%) followed by the United Kingdom (72%) and the United States (63.7%). In all samples, the BTAE was stronger than in the Swedish sample (51.3%). How can these differences be explained? One explanation is that the meaning of pro-environmental behaviors might differ across cultures. The content analysis of the Indian sample

Table 3. Descriptive statistics for the better-than-average effect in self-rated pro-environmental behaviors comparing “other people living in America” with “your friends” (American sample).

	Estimated position in sample						
	Much less	Moderately less	Slightly less	About the same	Slightly more	Moderately more	Much More
“Compared to other people living in America ...”	1.6%	2.4%	12.1%	20.2%	29%	23.4%	11.3%
“Compared to your friends ...”	0.8%	16.1% < Median 3.2% < Median	6.5%	27.4%	29.8%	63.7% > Median 23.4% > Median	8.9%

Table 4. Each of the rated pro-environmental behaviors for both me and other in both the United Kingdom and American sample ($n = 317$).

	My behavior, M (SD)	Others behavior, M (SD)	Standardized mean difference (d)
Turn off the lights when leaving a room	4.15 (0.93)	3.39 (1.02)	0.78
Keep the temperature moderately	3.92 (0.96)	3.29 (1.13)	0.60
Recycle plastic bottles	3.92 (1.15)	3.47 (0.99)	0.42
Turn off faucet when brushing teeth	3.89 (1.20)	3.03 (1.11)	0.74
Switch off air conditioner frequently	3.85 (1.15)	3.30 (1.13)	0.48
Take own bag for shopping	3.76 (1.27)	3.33 (1.06)	0.37
Take old items to second hand shops	3.36 (1.22)	3.02 (1.08)	0.30
Buy products with a green mark	3.14 (1.12)	2.97 (1.01)	0.16
Buy items from second hand shops	3.13 (1.20)	2.99 (1.03)	0.13
Turn off faucet when shampooing hair	2.63 (1.41)	2.65 (1.19)	-0.02
Total	3.58 (0.65)	3.14 (0.75)	0.63

showed that the most frequently stated behavior was “to plant a tree,” whereas U.K. and U.S. participants assessed multiple behaviors, and the Swedish sample assessed the general concept of pro-environmental behavior. Past research has found that the BTAE is weaker (or even reversed) for hard tasks (e.g., Moore, 2007). One explanation for these differences is therefore that the interpretation of pro-environmental behavior differs in perceived difficulty across countries.

The BTAE of pro-environmental behaviors was supported when assessing predefined pro-environmental behaviors. It is important to note that the effect sizes varied across behaviors, showing a range from -0.02 to 0.78 . The BTAE is higher for behaviors that people perceive they are conducting more often. To test this explanation, the frequency of participants’ own behavior was correlated with the BTAE effect size. Data showed a very strong positive correlation between the frequency of participants’ own behavior and the BTAE effect size ($r = .93$), suggesting that the BTAE is stronger for behaviors that are performed more frequently. To visualize this finding, the behaviors in Table 5 are presented in dissenting order based on frequency, demonstrating that more frequently conducted behaviors are associated with stronger effect sizes in the BTAE.

One limitation of Study 2 is that the BTAE was assessed by using an item that included dual statements, asking participant both “how much” and “how often”, they engaged in pro-environmental behaviors.¹

Therefore, Study 3 replicates the BTAE of pro-environmental behaviors by using two items: one for “how much” and the other for “how often.” In addition, as an open-ended question was used in the Indian sample, and predefined behaviors were used in the U.K. and U.S.-American samples, Study 3 assesses the BTAE of pro-environmental behaviors using an open-ended question in a U.S. sample.

Study 3: Replication and refinement

The main aim of Study 3 is to replicate the BTAE of pro-environmental behaviors, with methodological refinements. Study 3 assessed the BTAE of pro-environmental behaviors by (a) using separate items for “how much” and “how often” and (b) assessing pro-environmental behaviors using an open-ended question in a U.S.-American sample.

Method

A final sample of 401 U.S.-American individuals was recruited to an online survey using MTurk. All participants were given the opportunity to contact the author and were informed that their participation would be treated anonymously and confidentially, their information would be used only for research purposes, and they had the right to end their participation.

The item assessing the BTAE was split into two items asking participants the following: “Compared to

Table 5. Descriptive statistics for the BTAE in self-rated pro-environmental behaviors in a U.S.-American sample ($n = 401$) when controlling for “much” versus “often” and order effects of social comparison and self-reported pro-environmental behaviors (using the mean of *much* and *often*).

	Estimated position in sample						
	Much less	Moderately less	Slightly less	About the same	Slightly more	Moderately more	Much More
“... how often ...”	1.2%	3.7%	9.5%	23.2%	35.2%	22.2%	5.0%
“... how much ...”	1.2%	14.4% < Median	8.0%	25.2%	33.9%	62.4% > Median	4.7%
		3.2%				23.7%	
		12.4% < Median				62.3% > Median	

other people living in United States, how often would you say you engage in pro-environmental behaviors?” and “Compared to other people living in United States, how much would you say you engage in pro-environmental behaviors?”

Results and discussion

The obtained median for both “how often” ($\tilde{x}_{\text{obtained}} = 5$) and “how much” ($\tilde{x}_{\text{obtained}} = 5$) was above the expected median ($\tilde{x}_{\text{expected}} = 4$). Study 3 therefore replicated the BTAE of pro-environmental behaviors, showing that the effect holds when differentiating between “how often” and “how much” (see Table 5).

To compare the open-ended questions in the U.S. sample to the Indian sample in Study 2, a content analysis of the open-ended question was conducted. Results showed that the eight most frequently reported pro-environmental behaviors were recycling (reported by 62.6% of participants), conserving energy (29.4%), taking sustainable transportation (20.9%), reducing or avoiding plastics (20.7%), participating in eco-consumption (17%), conserving water (16.2%), avoiding littering (13.5%), and reusing and upcycling (13.5%). Other behaviors mentioned by fewer than 10% of respondents were gardening and composting (8%), reducing consumption (5.2%), planting trees/plants (4.7%), avoiding chemicals (4%), driving an eco-friendly car (4.2%), making pro-environmental donations (3.5%), buying local food (3.2%), buying secondhand (2.5%), reducing meat consumption (2.2%), reducing paper usage (2.2%), educating others (2.2%), using renewable energy sources (2%), reducing food waste (2%), buying organic food (1.7%), becoming more aware of environmental problems (1.5%), protecting wildlife (1.2%), reducing pollution (1.2%), eating vegan food (1%), reducing carbon footprint (1%), engaging in pro-environmental politics (1%), being connected to nature (0.7%), repairing things (0.5%), not smoking (0.5%), using fewer tree products (0.2%), not having kids (0.2%), avoiding products that have been tested on animals (0.2%), and using wood

for heat (0.2%; see also Appendix A for a comparison between the Indian and U.S. samples).

In sum, three studies consistently demonstrated that people perceive themselves as more pro-environmental than others. That is, the majority of respondents held exaggerated beliefs about their own contribution to climate change mitigation. Past research suggests that such a bias might serve as a psychological barrier impeding pro-environmental behaviors (e.g., Clayton et al., 2015; Gifford, 2011). Study 4 tests if assessing oneself as more pro-environmental than others indeed has negative effects for pro-environmental obligations and intentions.

Study 4: Does the BTAE decrease perceived obligation and intentions to act pro-environmentally?

Self-serving biases have shown to increase numerous risky behaviors (Gerrard, Gibbons, Reis-Bergan, & Russel, 2000; Weinstein & Klein, 1995; see Weinstein, 1989). Self-serving biases have therefore been proposed as a barrier limiting climate change mitigation, as these biases affect perceived risks of climate change (Gifford, 2011). Similarly, studies on moral licensing have found that conducting a first pro-environmental behavior “licenses” people to *not* behave pro-environmentally (Mazar & Zhong, 2010; see also Maki et al., 2019; Nilsson, Bergquist, & Schultz, 2017; Truelove, Carrico, Weber, Raimi, & Vandenberg, 2014). Therefore, one potential implication of the BTAE of pro-environmental behaviors is that if people perceive themselves to be more pro-environmentally than others, they will be less likely to feel obliged to act pro-environmentally and less likely to form pro-environmental behavioral intentions. Study 4 aims to (a) replicate the BTAE of pro-environmental behavior and (b) test if induced BTAE of pro-environmental behaviors decreases pro-environmental obligations and pro-environmental behavioral intentions.

Method

A final sample of 493 individuals was recruited from the United States to an online survey using MTurk. All participants were given the opportunity to contact the author and were informed that their participation would be treated anonymously and confidentially, their information would be used only for research purposes, and they had the right to end their participation.

All participants answered the self–others comparison question used in Study 2. In addition, all participants were presented with five items on pro-environmental obligations (e.g., “I feel obliged to turn off the lights when leaving a room,” “I feel obliged to recycle plastic bottles”; from 1 [*not at all obliged*] to 5 [*strongly obliged*]) and five items on pro-environmental behavioral intentions (“How often do you intend to engage in the following behaviors?” e.g., “Turn off the lights when leaving a room,” “Recycle plastic bottles”; from 1 [*never*] to 5 [*always*]; see the full scales in Appendix B). Using Qualtrics, the order of these measures was randomized so that half of the participants first answered the self–others comparison (i.e., induced BTAE) and then obligations and intentions, and the other half of the participants were presented with these questions in the opposite order.

If the BTAE of pro-environmental behaviors does decrease antecedents for pro-environmental behavior, lower pro-environmental obligations and intentions should be observed after inducing the BTAE. Thus, participants answering the self–others comparison question (i.e., induced by the BTAE) before the obligation and intention questions should report lower obligation and intentions than participants who answer these questions in the reverse order.

Results and discussion

In line with Studies 1–3, the obtained median ($\tilde{x}_{\text{obtained}} = 5$) was above the expected median ($\tilde{x}_{\text{expected}} = 4$), and in line with data collected in a U.S.-American sample, the percentage of the sample perceiving themselves as above the expected median was 65.3%. These data once again replicate the BTAE of pro-environmental behaviors.

The items assessing obligation ($\alpha = .76$, $n = 493$) and intention ($\alpha = .66$, $n = 493$) showed low to moderate reliability. Index variables for obligation and intention were created for the main analysis. To assess the potential influence of the BTAE on obligation and intention, Cohen’s d was calculated for the difference between participants who answered the self–others comparison

question before the obligation and intention questions and participants who answered the obligation and intention questions before the self–others comparison question. Results showed a negligible effect on obligation ($d = -0.06$). For pro-environmental behavioral intentions, a small decrease was found for participants induced by the BTAE ($d = -0.15$).

The data did not support that inducing participants to perceive themselves as more pro-environmental than others (i.e., induced BTAE) decreases pro-environmental obligation. The data did show an effect in the predicted direction for pro-environmental intentions, indicating that induced BTAE might repress people’s intentions to engage in future pro-environmental behaviors. From a theoretical perspective, this effect is smaller than expected, as Blanken, van de Ven, and Zeelenberg’s (2015) meta-analysis on moral-licensing reported a mean effect of $d = 0.31$. Yet, from a practical perspective, even a small effect size can have an important impact on climate change mitigation when applied on a large scale (e.g., Allcott, 2011).

In sum, Study 4 replicated the BTAE of pro-environmental behaviors and provided an empirical test of the hypothesis that self-serving biases serve as a psychological barrier to future pro-environmental behaviors. Data showed no (negative) effect on obligation, whereas intentions were weakly decreased. Hence, at present, the hypothesis of an inhibiting effect of self-serving biases on future pro-environmental behaviors has weak support.

General discussion

The present research aimed to test if people perceive themselves as more pro-environmental than others, a hypothesis often discussed (e.g., Clayton et al., 2015; Gifford, 2011) yet not previously tested empirically. Four studies consistently demonstrated the BTAE in pro-environmental behaviors, using 4,042 participants. The data clearly support a self-serving bias causing people to overestimate their own climate change mitigation, suggesting that most people perceive themselves as more pro-environmental than others. The BTAE of pro-environmental behaviors was validated in four countries (Sweden, India, United Kingdom, and United States) and was found to hold for nine of 10 pro-environmental behaviors and for both abstract (other Americans) and concrete (my friends) reference groups. Study 4 tested the hypothesis that self-serving biases serve as a barrier for future pro-environmental engagement. Data showed that inducing people to perceive themselves as better than average (in terms

of pro-environmental engagement) had negligible effects on pro-environmental obligations and weak effects on intentions for future pro-environmental engagement. Although a weak effect could have important practical implications, as the BTAE in pro-environmental behaviors might be a barrier for future behavior (Gifford, 2011), these results should be interpreted with caution and validated by future research.

Validity and implications of the BTAE

The aim of this research was to test the validity and implications of the BTAE. Studies 1–3 focused on validity: assessing external, internal, and content validity by testing if the BTAE would generalize across countries, pro-environmental behaviors, and reference groups and would hold across operationalization's and methodological variations. Hence, both applied and theoretical aspects of the BTAE were tested. In the light of the “replication crisis” (Nelson, Simmons, & Simonsohn, 2018; Open Science Collaboration, 2015), replicating well-established effects (such as the BTAE) is important for validity—that is, to gain accumulated knowledge on boundaries, generalizations, and implications of psychological effects.

Variability in the BTAE

The strength of the BTAE varied across countries, showing the strongest effect in India (85.7%) followed by the United Kingdom (72%) and the United States (63.7%). The weakest effect was observed in the Swedish sample (51.3%). One explanation, as discussed in Study 2, is that the interpretation of pro-environmental behaviors differed across cultures. Content analyses comparing the Indian versus the U.S.-American sample support this assumption. Yet it is unclear if and how such differences can explain the variance in the BTAE. Another possible explanation is that the BTAE of pro-environmental behaviors is affected by values and attitudes that might differ between the countries. Yet data from the World Values Survey cannot provide sufficient support for this explanation (Ingelhart et al., 2014), showing no noticeable differences between relevant values (i.e., “Looking after the environment ... care for nature and save life resources”) in Sweden ($M = 2.46$, $SD = 1.2$) versus India ($M = 2.54$, $SD = 1.6$). Similarly, the majority of participants prioritized “protecting the environment” over “economic growth” in both countries (Sweden = 65.2%, India = 69.8%). A third explanation might be linked to cross-cultural differences in

response biases. Van de Vijver and Poortinga (1997) warned against interpreting intergroup differences in cross-cultural research without examining equivalence. Indeed, several studies have observed substantial differences in response biases such as extreme response styles and acquiescent responding across countries (e.g., Harzing, 2006; Johnson, Kulesa, Cho, & Shavitt, 2005; Smith, 2004). However, further research is necessary to explore the mechanisms underlying these differences in more detail (Johnson et al., 2005). In sum, although the BTAE of pro-environmental behaviors was validated across countries, it remains unclear why the strength of the BTAE varies between countries.

Reference group

Alicke and Govorun (2005) suggested that the BTAE decreases when comparing oneself to a “real person” rather than a more abstract concept (i.e., “other Swedes”). Past research has shown that the BTAE was reduced when asking students to compare themselves with “the person sitting next to them” rather than “the average college student” (Alicke, Klotz, Breitenbecher, Yurak, & Vredenburg, 1995). Therefore, Study 2 tested two reference groups with different level of abstraction “Americans” (abstract group), and “your friends” (concrete group). Results showed highly similar results of the BTAE in the two reference groups (63.7% vs. 62.1% above average). Given that participants are thinking about different reference groups when being asked about “my friends” versus “other Americans” and that these groups differ in their level of pro-environmental engagement, it is noticeable that people still overestimate their own pro-environmental engagement in relation to their “friends.”

BTAE as a psychological barrier

Study 4 was designed to test the hypothesis that the BTAE is a psychological barrier for climate change mitigation (Gifford, 2011). This hypothesis was derived from the research on negative spillover effects, predicting that a first moral behavior might “license” a subsequent immoral behavior (e.g., Blanken et al., 2015). It should be noted that research has also demonstrated positive spillover effects, where a first pro-environmental action encourages subsequent pro-environmental actions (e.g., Nilsson et al., 2017; Truelove et al., 2014). This hypothesis is also in line with a self-valuation hypothesis, increasing

self-efficacy (Bandura, 1977), which has been demonstrated to predict behavioral intentions (Ajzen, 1985, 1991). Therefore, one explanation for the weak negative effect on pro-environmental intention is that a dual-process of both negative and positive spillover effects is at work. It could be that the BTAE is fostering pro-environmental intentions for some people while undermining pro-environmental intentions for others. Another explanation for the weak negative effect on intentions is based on the suggestion that the BTAE is a form of availability heuristics (see the following discussion). More specifically, if performing a behavior with a high frequency makes that behavior cognitively available, and thus increases the BTAE, frequency should also moderate the BTAE as a psychological barrier, making high-frequency behaviors more influential than low-frequency behaviors. Past research has identified a number of potential moderators driving the positive versus negative spillovers (e.g., Nilsson et al., 2017; Truelove et al., 2014). Future research should examine if and which moderators might cause the BTAE to foster versus undermine subsequent pro-environmental engagement.

The mechanisms of the BTAE

What are the psychological mechanism driving the BTAE? When analyzing the data from Study 2, the frequency of behavioral engagement was strongly positively correlated with the BTAE effect size. One interpretation of this finding is that performing a specific behavior with a high frequency is interpreted as also performing that behavior more frequently than others. This suggests that the BTAE is driven by the availability heuristic (Tversky & Kahneman, 1973), as people may be influenced by how cognitively available a certain behavior is when evaluating *relative* performance. Future research should further examine if the availability heuristic can explain the BTAE.

Limitations

As a first limitation, cultural comparison was confounded with means of assessing pro-environmental behavior. In the Indian sample, pro-environmental behaviors were assessed by open-ended questions, whereas predefined questions were used in the U.S. and U.K. samples. Could the differences in the BTAE between cultures have been influenced by the measurement method? Although open-ended versus predefined measurements were not used within the same sample, Study 2 reported an effect of 63.7% above the

median, which was similar to Study 3 with an effect of 58.7% to 63.2% above the median. Studies 2 and 3 both used a U.S.-American sample, whereas pro-environmental behaviors were assessed by predefined questions in Study 2 and open-ended questions in Study 3, suggesting that the BTAE was not affected by using open-ended compared to predefined questions.

As a second limitation, when testing whether the BTAE affected pro-environmental obligation and intention in Study 4, order effects were not controlled for. Past research has shown that other compensatory behaviors, such as cognitive dissonance reduction strategies, are affected by order (e.g., Fointiat, Somat, & Grosbras, 2011; Gosling, Denizeau, & Oberlé, 2006). It should however be mentioned that these studies find that the first items are more influential than subsequent items. Therefore, in the present study, it would be predicted that obligations are weaker than intention. Yet we observed the opposite pattern, speaking against the influence of order effects. In any case, lack of randomization should be noted as a limitation in Study 4.

Worse than average

There are circumstances moderating or even reversing the effect. The BTAE may be moderated by both desirability and controllability, such as the effect holding for highly desirable traits but not for traits low in desirability, and that the effect is stronger for high controllable than low controllable traits (Alicke, 1985). It has been demonstrated that people view themselves as “worse than average” when evaluating their ability on difficult tasks (Moore, 2007). For example, students’ average rating of the likelihood of winning a trivia contest was 70% when the contest included easy quiz questions, whereas ratings dropped to only 6% for a contest including hard quiz questions (Kruger, 1999). Although we demonstrated the BTAE in nine of 10 pro-environmental behaviors, these were all everyday behaviors that are relatively easy to perform. Future research should test if the BTAE also holds when assessing “harder” pro-environmental actions.

Taken together, this article consistently demonstrates that the BTAE applies to pro-environmental behaviors; nevertheless, the evidence for the BTAE as a psychological barrier for future pro-environmental behaviors is weak and should be explored in future research. BTAE of pro-environmental behaviors was supported across four countries, testing 10 pro-environmental behaviors, and when assessing both

closed- and open-ended questions as well as both concrete and abstract reference groups.

Note

1. This formulation was chosen because, when asking about pro-environmental behavior in general, people could assess their pro-environmental behavior in terms of how much and/or how often they do this, depending on the specific behavior they are assessing.

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Appendix A

Behavior	% of participants reporting each behavior in the samples	
	United States	India
Recycling	62.6%	5.1%
Energy conservation	29.4%	8.2%
Sustainable transportation	20.9%	11.2%
Reduce or avoid plastics	20.7%	26.5%
Eco-consumption	17.0%	5.6%
Water conservation	16.2%	11.2%
Avoid littering	13.5%	12.8%
Reusing and upcycling	13.5%	—
Gardening and composting	8.0%	—
Reduce consumption	5.2%	2.0%
Planting trees/plants	4.7%	35.7%
Avoiding chemicals	4.0%	2.0%
Driving an eco-friendly car	4.2%	—
Pro-environmental donations	3.5%	—
Buying local food	3.2%	0.5%
Buying secondhand	2.5%	—
Reduce meat consumption	2.2%	0.5%
Reduce paper usage	2.2%	0.5%
Educating others	2.2%	3.6%
Using renewable energy sources	2.0%	—
Reduce food waste	2.0%	1.0%
Buying organic food	1.7%	2.6%
Becoming more aware of environmental problems	1.5%	—
Protect wildlife	1.2%	2.6%
Reducing pollution	1.2%	4.1%
Eating vegan food	1.0%	—
Reducing carbon footprint	1.0%	—
Engaging in pro-environmental politics	1.0%	1.0%
Being connected to nature	0.7%	—
Repairing things	0.5%	—
Don't smoke	0.5%	—
Use fewer tree products	0.2%	0.5%
Have no kids	0.2%	—
Avoid products that have been tested on animals	0.2%	—
Use wood for heat	0.2%	—
Use fewer tree products	—	1.0%
Don't cut down trees	—	0.5%
Eating less	—	0.5%
Not use firewood when cooking	—	0.5%
Use lighting instead of firecrackers for traditional festivities	—	0.5%

Appendix B

Five items were used to measure pro-environmental obligations

(1) "I feel obliged to turn off the lights when leaving a room." (2) "I feel obliged to switch off the air conditioner frequently." (3) "I feel obliged to keep the temperature moderate." (4) "I feel obliged to take old items to secondhand shops." (5) "I feel obliged to recycle plastic bottles." All of these items are measured on a scale from 1 (*not at all obliged*) to 5 (*strongly obliged*).

To assess pro-environmental intentions, participants were asked, "How often do you intend to engage in the following behaviors?" followed by the five behaviors:

(1) "Turn off the lights when leaving a room." (2) "Switch off the air conditioner frequently." (3) "Keep the temperature moderate." (4) "Take old items to secondhand shops." (5) "Recycle plastic bottles." All of these items were measured on a scale from 1 (*never*) to 5 (*always*).