

World Beliefs Predict Self-Reported Sustainable Behaviors Beyond Big Five Personality Traits and Political Ideology

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Abstract

Generalized beliefs about the world—termed ‘primal world beliefs’ or ‘primals’—have been hypothesized to affect behavior, since they contain information which influences the perceived costs, benefits, and justifications for different behaviors. For example, people who see the world as highly improvable may view prosocial behaviors as having more benefits and therefore be more inclined to work harder on making things better. Three preregistered studies ($N = 1,534$ US participants) investigated the relationship between primals and several measures of people’s propensity toward sustainable behavior. Beliefs that the world is less hierarchical, but more improvable, cooperative, harmless, meaningful, and abundant were weakly to moderately associated with self-reported ethically-minded consumer behavior, pro-environmental behavior, and behavioral intentions. These relationships were largely robust to controlling for Big Five traits and political ideology, although some of the relationships were subsumed by the more general belief that the world is good. Changes in two world beliefs (cooperative, harmless) over a three-week period weakly predicted pro-environmental behavior intentions when controlling for people’s previously reported pro-environmental behavior. These correlational findings suggest some possible avenues for future research: if these beliefs are found to be causally prior to



environmental attitudes, they may offer a promising target for interventions aimed at increasing sustainable behavior.

Keywords

sustainable behavior, primal world beliefs, primals, pro-environmental behavior, ethical-minded consumer behavior

Non-Technical Summary

Background

Human behavior is one of the major causes of climate change and several other environmental threats. Therefore, it is important to better understand the psychology underlying and motivating sustainable behaviors. Since beliefs influence individuals' attention, interpretation of events, thoughts, and behavior, the study of beliefs might provide an especially helpful foundation for interventions aiming to encourage sustainable behaviors.

Why was this study done?

The goal of this study was to understand the association between generalized beliefs about the world and sustainable behaviors. Specifically, we investigated if a variety of self-reported and actual sustainable behaviors (e.g., pro-environmental behavior, ethically-minded consumer behavior, donation behavior) were associated with the belief that the world is more abundant, cooperative, meaningful, improvable, and harmless, but less hierarchical.

What did the researchers do and find?

In one study with undergraduate students from a private American university and two with US-Americans from the general population, we tested the relationship between generalized beliefs about the world and people's self-reported sustainable behaviors. In the third study, we also tested if changes in these world beliefs predict pro-environmental intentions when controlling for self-reported pro-environmental behavior measured three weeks prior. We also attempted to manipulate the belief in a cooperative world using a social exclusion experiment to test whether this would, in turn, influence pro-environmental behavior intentions.

Our results showed that people who believe that the world is less hierarchical, but more cooperative, meaningful, abundant, improvable, and harmless were more likely to report that they engaged in pro-environmental behavior. Furthermore, results revealed that changes in cooperative and harmless world belief predicted pro-environmental behavior intentions even when controlling for previously reported pro-environmental behavior. However, we were not able to manipulate the belief in a cooperative world in our social exclusion experiment and were therefore unable to directly test the causal hypothesis that cooperative beliefs influence pro-environmental behavior intentions.

What do these findings mean?

Our findings suggest that generalized beliefs about the world might be important to understanding sustainable behaviors. One possible interpretation is that the way individuals see the world might have an influence on their propensity to engage in sustainable behaviors and subsequently their actual behaviors. However, the findings here were correlational and further research is necessary to properly test this hypothesis. Further, it should be noted that we mostly used self-reports in this study to test these relationships. Future research might test if results can be replicated when measuring sustainable behaviors directly.

Highlights

- Beliefs that the world is less hierarchical, but more cooperative, meaningful, abundant, improvable, and harmless are weakly to moderately correlated with self-reported ethically-minded consumer and pro-environmental behavior.
- Most of the associations between the beliefs that the world is hierarchical and cooperative and different self-reported and actual sustainable behaviors remained robust to controlling for sex, religiosity, political ideology, and income.
- At least two world beliefs (i.e., hierarchical, abundant) add explanatory value in self-reported ethically-minded consumer behavior and pro-environmental behavior, beyond the belief in a good world and Big Five traits.
- Changes in the beliefs that the world is cooperative and harmless predict pro-environmental behavior intentions beyond previously reported pro-environmental behavior (although effects were small), suggesting that targeting these primals could represent a promising route to maximizing the impact of interventions aimed at promoting sustainable behaviors.

Human behavior is a major factor in the catastrophic effects of climate change and other environmental threats (IPCC, 2022; Madsen et al., 2014; McKinney, 2002; Swim et al., 2011). Consequently, scholars have stressed the need to better understand the psychology underlying sustainable behaviors targeted at protecting the environment (e.g., Bamberg & Möser, 2007; Hilbig et al., 2013; Hines et al., 1987; Hirsh & Dolderman, 2007; Stern, 2000). Here, we expand on existing research by investigating connections between individuals' propensity to engage in sustainable behaviors and several 'primal' world beliefs, which are fundamental, generalized beliefs about the nature of the world, such as "the world is abundant".

Individual Differences and Sustainable Behaviors

One approach to identifying meaningful individual differences that could underlie sustainable behaviors has been to look at people's general behavioral tendencies (i.e., personality traits). Given the importance of personality models such as the Big Five and

HEXACO in predicting a range of real-life behaviors (e.g., Barlett & Anderson, 2012; Shimotsukasa et al., 2019), it is unsurprising that several studies have found them to be predictive of sustainable attitudes and behaviors (Brick & Lewis, 2016; Conner & Abraham, 2001; Milfont & Sibley, 2012; Kaiser et al., 1999; Stern, 2000). Probably the most consistent finding to date is that people higher in openness tend to report behaving more frequently environmentally-friendly and having stronger intentions and goals to engage in pro-environmental behaviors (Hilbig et al., 2013; Hirsh & Dolderman, 2007; Kesenheimer & Greitemeyer, 2021; Markowitz et al., 2012). Evidence regarding other traits has been more ambiguous, but a recent meta-analysis focused on the HEXACO model found evidence of associations with pro-environmental attitudes and donation behaviors for honesty/humility and openness (Soutter et al., 2020), while emotionality and extraversion were associated with stronger pro-environmental attitudes (but not donation behaviors). While most of these findings use cross-sectional data, longitudinal studies have also linked changes in HEXACO traits, and especially agreeableness, to changes in both attitudes and behaviors (Hopwood et al., 2022).

While personality traits are important predictors of sustainable attitudes and behaviors, identifying additional sources of individual difference may be theoretically important. Changing personality traits often requires interventions that are time-consuming and, for some traits such as emotional stability, are only effective in participants who choose to work on them autonomously (e.g., Hudson, 2021). If more malleable individual difference variables exist, they may provide a better foundation for interventions aiming to increase sustainable behaviors. Dweck argues that beliefs may be causally prior to personality traits and more readily malleable (Dweck, 2008, p. 392):

“Beliefs can typically be defined very precisely, measured very simply, and altered through intervention to reveal their direct impact. In contrast, broad personality traits can be assessed, but they contain no implications for how you might change them. Beliefs are not necessarily easy to change, but they tell you where to begin.”

Moreover, by guiding attention and the interpretation of events (e.g., Clifton, 2020), beliefs are hypothesized to be one of the keys to understanding how individuals think and act (e.g., Dweck, 2017). Thus, when identifying correlates of sustainable behaviors, in addition to dispositional behavioral tendencies (i.e., personality traits), it may be beneficial to examine beliefs as a potential lever for change (e.g., Feinberg & Willer, 2011; White et al., 2012).

World Beliefs and Sustainable Behaviors

There is already some evidence for the importance of beliefs about the world in motivating sustainable behaviors. For example, belief in a just world appears to motivate fair-trade support if people are informed that injustice towards food producers can be re-

dressed through their purchase (White et al., 2012). Similarly, people who believe in pure altruism and the existence of selfless, impartial, and non-violent people in the world, are more likely to report more eco-friendly consumer behaviors, such as buying products with good environmental ratings (Webster et al., 2021). The belief that meaning and purpose can be discovered in one's life is related to more pro-environmental engagement and voluntary service (Lin, 2019; Scales et al., 2014).

Although these studies suggest that world beliefs could represent an important source of insight into sustainable behaviors, research has so far focused on only a few world beliefs, such as beliefs that the world is just and meaningful. This is partly because, until recently, only a few world beliefs have been reliably measured (and the few existing scales were developed independently of one another, leaving unknown degrees of overlap). A recent empirical effort combined extensive exploratory research (e.g., analysis of tens of thousands of tweets, hundreds historical texts, ten focus groups) with multi-round factor analysis to identify 26 fundamental ways in which people talk (and disagree) about the general characteristics of the world (Clifton et al., 2019). These were called *primal world beliefs* or *primals* to distinguish them from more factual beliefs such as “everything in the world is made up of 118 chemical elements”. This newly mapped, structured collection of world beliefs allows a broader and more systematic study of how worldview relates to sustainable behaviors.

Among these 26 world beliefs, a subset has intuitive potential to contribute to sustainable behaviors. First, we predicted that cooperative world belief would be associated with sustainable behaviors, since it makes more sense to act sustainably in a world that runs on trust and teamwork rather than one where everybody focuses on their own interests. Second, if people see the world as easily improvable, they might be more likely to engage in sustainable behaviors. Previous studies have already revealed the positive impact of hope and optimism on pro-environmental intentions and behaviors (Chadwick, 2015; Kaida & Kaida, 2019; Rafiq et al., 2022). Third, people who see the world as more hierarchical—where some people, countries, and species are inherently better than others—may have lower propensity to engage in behaviors aimed at helping less wealthy people, beleaguered nations, and endangered species. Hierarchical world belief is also the primal most tied to conservative political ideology (Clifton & Kerry, 2023), which has been shown to be important for vegetarianism (e.g., Hodson & Earle, 2018; Pfeiler & Egloff, 2018).

Overview of the Present Research

Thus, in *Study 1*, we conducted a cross-sectional study with a student sample to explore the relationships between cooperative, improvable, and hierarchical world beliefs and people's propensity to engage in sustainable behaviors (e.g., self-reported ethically-minded consumer behavior, plant-based diet). We further explored the relationship between the self-reported sustainable behaviors and the remaining 23 primals. As it may be more

appealing to use one's own resources to improve the world (i.e., through spending more on ethical products) if you see the world as a more abundant place, full of opportunities and resources, we also analyzed the moderating role of abundant world belief in these relations.

In Study 2, we aimed to extend the results of Study 1 to a broader range of sustainable behaviors including a non-self-report measure among a non-student sample and tested whether their explanatory value was accounted for by Big Five personality traits.

In Study 3, experimental and longitudinal investigations were conducted to test the causal impact of primals on pro-environmental behavior intentions. Building on Studies 1–2 we again focused on cooperative, hierarchical, improvable, harmless, meaningful, and abundant world belief. In the experimental manipulation, we let participants play an online social game where they were systematically excluded aiming to manipulate their cooperative world belief.

In all three studies, we controlled for a variety of demographic factors, including age and political orientation, as they have been shown to correlate with both primals (e.g., Clifton et al., 2019) and (self-reported) sustainable behaviors (e.g., Larson et al., 2011; Sockhill et al., 2022). Because of potential social biases in self-reported sustainable behaviors (e.g., Koller et al., 2023), we additionally controlled for social desirability in Study 1. Data, code, and materials for all three studies is publicly available at Kerry and Hämpke (2024b).¹

Study 1

Study 1 tested relationships between primals and two indicators of individuals' propensity to engage in sustainable behaviors: self-reported ethically-minded consumer behavior and plant-based diet. Although Study 1 was primarily exploratory (and hence included measures of all 26 primals), we preregistered three hypotheses (see Kerry & Clifton, 2022):

H1: Cooperative world belief will be positively correlated with self-reported ethically-minded consumer behavior.

H2: Improvable world belief will be positively correlated with self-reported ethically-minded consumer behavior.

H3: Hierarchical world belief will be negatively correlated with self-reported ethically-minded consumer behavior and people's likelihood to report being vegan, vegetarian, or restricting meal intake for ethical reasons.

1) The present data are not used in other publications and unpublished manuscripts.

In addition to testing bivariate correlations, we preregistered analyses controlling for political ideology, social desirability, and sex.

Method

Participants and Procedure

Participants were 381 undergraduate students at a private university in the USA participating for course credit.² This sample was chosen for convenience. We excluded 21 students for failing an attention check, leaving 359 (104 male, 251 female, 4 not specified), ages 18–24, $M = 20.02$; $SD = 1.06$.³ This sample size allows more than 80% power to detect small correlations of $r = .15$. Participants were 8% African-American or Black, 41% White, 10% Spanish, Hispanic, or Latino, 4% Middle Eastern, and 35% Asian (3% did not report ethnicity). Politically, 57% were Democrats, 11% Republican, 11% other, while 21% did not indicate any affiliation. 34% were Christian, 1% Hindu, 3% Buddhist, 6% Muslim, 15% Jewish, 2% other religion, 9% spiritual, and 30% atheist or agnostic.

Participants completed questionnaires online, with the main components presented in randomized order (there were no order effects on key variables). There was no experimental manipulation.

Measures

Primal World Beliefs — All 26 primals were measured using the 99-item Primals Inventory (PI-99, Clifton et al., 2019). Participants were asked to share their sense of agreement or disagreement with 99 statements (0 = *Strongly agree*; 5 = *Strongly disagree*), such as “The world is a place where things are fragile and easily ruined”. Reliabilities ranged from Cronbach’s $\alpha = .74$ –.91 (see Hämpke et al., 2024, Supplement Table S1).

— Sustainable Behaviors —

Self-Reported Ethically-Minded Consumer Behavior

The Ethically-Minded Consumer Behavior scale (Sudbury-Riley & Kohlbacher, 2016) has participants rate 10 statements on their environmentally friendly and socially responsible consumer behavior (1 = *Never true*; 5 = *Always true*). The scale measures several facets of individuals’ propensity to engage in ethically-minded consumer behavior—buying environmentally friendly products, recycling issues, product boycotting due to environmental concerns, etc., e.g., “I do not buy household products that harm the environment”. Cronbach’s alpha indicated good internal consistency ($\alpha = .89$).

2) Sample size deviates from preregistered sample size due to incomplete surveys marked as complete.

3) Approximated only; the survey asked participants their year of birth and did not distinguish between 18- or 19-year-old participants due to an error in the survey.

Plant-Based Diet

We measured the extent to which people restricted meat and dairy consumption using one item that asks participants: “Which of these best describes your eating habits?”. This was measured ordinally: participants with no dietary restrictions were rated as 1, those with occasional restrictions on meat and fish as 2, vegetarians as 3, and vegans as 4. If participants indicated not being vegetarian or vegan, a follow-up item asked participants to rate the likelihood of becoming vegetarian in the future (0% = *There is no chance at all*; 100% = *Absolutely certain*).

Covariates – Social desirability was measured with the Reynolds’ (1982) 11-item version of the Marlowe-Crowne Social Desirability Scale. The scale asks participants to report their usual social behavior by agreeing or disagreeing to statements (1 = *True*; 2 = *False*) that describe socially acceptable and unacceptable behaviors such as “There have been occasions when I took advantage of someone” (reversed). The Kuder-Richardson-20-coefficient indicated a poor internal consistency within this sample ($r_{KR20} = .54$). This reliability coefficient was used given the scale’s dichotomous answer options. We decided to drop Item 10 to slightly improve the scale’s reliability (not preregistered, $r_{KR20} = .61$).

Political ideology was measured by a single item asking participants “Which of the following best describes your political orientation?” (0 = *Very liberal*; 6 = *Very conservative*). Scores are referred to as ‘conservatism’ in tables below to indicate direction. Another single item measured religiosity: “To what extent do you consider yourself to be a religious person?” (1 = *Not religious at all*; 10 = *Extremely religious*).

Results

Data for all studies were analyzed using IBM SPSS Statistics (Version 29).

Preregistered Analyses

As predicted, hierarchical world belief was negatively related with self-reported ethically-minded consumer behavior, $r = -.24$, 95% CI [-0.34, -0.14], $p < .001$, plant-based diet, $r = -.18$, 95% CI [-0.28, -0.08], $p < .001$, and the intention to become vegetarian in non-vegetarians, $r = -.19$, 95% CI [-0.29, -0.08], $p < .001$. Further, participants who scored higher on cooperative world belief scored higher on self-reported ethically-minded consumer behavior, $r = .11$, 95% CI [0.00, 0.21], $p = .042$. However, no significant association between improvable world belief and self-reported ethically-minded consumer behavior was found, $r = -.02$, 95% CI [-0.13, 0.08], $p = .650$. Supplementary Table S2, Hämpke et al. (2024) shows descriptive statistics and correlations between all focal variables. Supplementary Table S3, Hämpke et al. (2024) shows correlations for all 26 primals.

While associations of hierarchical world belief with both self-reported ethically-minded consumer behavior and plant-based diet were robust to four preregistered cova-

riates—sex, political ideology, religiosity, and social desirability—the correlation between cooperative and self-reported ethically-minded consumer behavior was not (Table 1).

Exploratory Analyses

Correlations between other primals and self-reported ethically-minded consumer behavior were nonsignificant, except for the relationship between *just world belief* and plant-based diet, $r = -.19$, 95% CI [-0.31, -0.11], $p < .001$. However, this association could be confounded by political ideology (since conservatives see the world as more just and are less likely to be vegetarians). However, a moderated regression with both *just world belief* and political ideology still found a unique association with just, $b = -0.17$, 95% CI [-0.28, -0.07], $\beta = -0.24$, $p = .001$, despite the significant association with lower political conservatism, $b = -0.22$, 95% CI [-0.36, -0.08], $\beta = -0.46$, $p = .003$, and independently from the level of political conservatism, $b = -0.05$, 95% CI [0.00, 0.09], $\beta = 0.31$, $p = .074$.

Exploratory moderated regression analyses (PROCESS model 1, Hayes, 2022) revealed that abundant world belief moderated the effect of the beliefs that the world is improvable, $b = -0.13$, 95% CI [-0.25, -0.01], $p = .037$, hierarchical, $b = 0.07$, 95% CI [0.00, 0.14], $p = .041$, harmless, $b = -0.13$, 95% CI [-0.22, -0.03], $p = .010$, and good, $b = -0.17$, 95% CI [-0.30, -0.04], $p = .010$, on self-reported ethically-minded consumer behavior, such that correlations were stronger among people who saw the world as less abundant (Table S4 and Figure S1, Hämpke et al., 2024).

Discussion

Study 1 found that cooperative and hierarchical, but not improvable world belief, were associated with self-reported sustainable behaviors, with hierarchical belief remaining significant after controlling for sex, political ideology, religiosity, and the tendency to give socially desirable answers. Abundant world belief moderated the effect of the belief in an improvable, hierarchical, harmless, and good world on self-reported ethically-minded consumer behavior.

Table 1

Preregistered Regression Analyses to Predict Self-Reported Ethically-Minded Consumer Behavior and Plant-Based Diet Using Hierarchical or Cooperative World Beliefs and Control Variables

Dependent variable	Model Effect	b	SE b	β	LL	95% CI		p
						UL	LL	
Self-reported ethically-minded consumer behavior	1 (Constant)	2.59***	0.25		2.11	3.07		< .001
	Hierarchical	-0.12**	0.04	-0.17	-0.20	-0.05		.001
	Sex (female)	0.19*	0.08	0.13	.04	.34		.013
	Political ideology	-0.07**	0.03	-0.15	-.13	-.02		.008
	Religiosity	-0.02	0.01	-0.06	-.04	-.01		.288
	Social desirability	0.04**	0.02	0.14	0.01	.08		.009
	(Constant)	2.20***	0.25		1.71	2.69		< .001
Plant-based diet	2 (Constant)	0.06	0.04	0.08	-0.02	0.13		.125
	Sex (female)	0.21**	0.08	0.14	0.06	0.36		.007
	Political ideology	-0.09**	0.03	-0.18	-0.14	-0.04		< .001
	Religiosity	-0.02	0.01	-0.07	-0.05	0.01		.181
	Social desirability	0.04**	0.02	0.14	0.01	0.08		.008
	(Constant)	1.52***	0.23		1.06	1.98		< .001
	Hierarchical	-0.08*	0.04	-0.12	-0.15	-0.01		.028
Sex (female)	0.07	0.07	0.05	-0.08	0.21		.363	
Political ideology	-0.08**	0.03	-0.18	-0.13	-0.03		.002	
Religiosity	-0.01	0.01	-0.05	-0.04	0.02		.398	
Social desirability	0.01	0.02	0.03	-0.02	0.04		.630	

Note. N = 356. $R^2_1 = .12$, $F_1(5, 349) = 9.37$, $p_1 < .001$. $R^2_2 = .10$, $F_2(5, 349) = 7.61$, $p_2 < .001$. $R^2_3 = .07$, $F_3(5, 349) = 5.55$, $p_3 < .001$. CI = Confidence Interval; LL = Lower Limit; UL = Upper Limit.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Study 2

Study 2 aimed to replicate the findings of Study 1 using a further measure of self-reported sustainable behaviors as an indicator of individuals' propensity to engage in sustainable behaviors. This new measure collected self-reports of everyday pro-environmental behaviors, such as transportation habits, going beyond self-reported ethically-minded consumer behavior. Study 2 also tested whether the findings of Study 1 could be detected for a direct, non-self-report measure of sustainable behavior: donations to an environmental charity. We targeted a non-student US-American population since the US is the second largest CO₂ emitter in the world (Global Carbon Atlas, 2023). Based on Study 1 findings, we preregistered (see Kerry & Hämpke, 2024a) predictions that:

H1: Cooperative world belief is positively correlated with self-reported ethically-minded consumer behavior and pro-environmental behavior.

H2: Hierarchical world belief is negatively correlated with self-reported ethically-minded consumer behavior and pro-environmental behavior.

H3: The relationships between hierarchical (negative association), cooperative (positive), harmless (positive), improvable (positive) and good (positive) world beliefs and self-reported ethically-minded consumer behavior or pro-environmental behavior is stronger at lower levels of abundant world belief.

Further, we planned to conduct exploratory analysis to test whether the primals of interest predicted additional variance beyond that explained by Big Five personality traits, demographics, and the overall belief in a good world.

Method

Participants and Procedure

607 paid US-Americans were recruited via Prolific.com and compensated with \$2.00 (median completion time was 10 minutes).⁴ Thirteen were excluded due to failing an attention check; five more were excluded as they indicated dishonest answering at the end of the survey (not preregistered). The final sample consisted of 589 participants (288 male, 295 female, 6 not specified), aged 18–81 years, $M = 38.17$, $SD = 13.41$. This sample size allows 95% power to detect small correlations of $r = .15$. 8% were African American or Black, 73% Caucasian, 6% Spanish, Hispanic, or Latino, 0.7% American

4) The sample sizes in Study 2 and Study 3 exceed the preregistered sample sizes as some participants were timed out by Prolific but still produced useful data.

Indian or Alaskan Native, 0.3% Middle Eastern and 9% Asian, while 3% of the participants did not report ethnicity. Regarding their political ideology, 46% described themselves as Democrats, 15% as Republican, 3% as Libertarian, 25% as independent, and less than 1% as Green. 10% did not indicate any party affiliation. 42% of the participants indicated to be Christian, 1% Hindu, 1% Buddhist, 1% Muslim, 2% Jewish, 3% belonged to other religions, 14% spiritual, and 36% atheist or agnostic. On average, participants earned \$46,189 per year ($SD = \$46,195$, range = \$0–\$480,000).

Measures

Primal World Beliefs — To measure participants' harmless, cooperative, hierarchical, improvable, abundant, and meaningful world beliefs, we used the relevant subscales of the 99-item Primals Inventory (PI-99, Clifton et al., 2019). Participants' good world belief was measured with the shorter 18-item Primals Inventory (PI-18, Clifton & Yaden, 2021) which asks participants to agree or disagree with statements (0 = *Strongly agree*; 5 = *Strongly disagree*), such as "Most things in the world are good". Reliabilities ranged from $\alpha = .76-.91$ (Table S5, Hämpke et al., 2024).

Self-Reported and Actual Sustainable Behaviors — Self-reported and actual sustainable behaviors were operationalized using four specific measures:

Self-Reported Ethically-Minded Consumer Behavior

Self-reported ethically-minded consumer behavior ($\alpha = .93$) was measured using the same scales as in Study 1.

Plant-Based Diet

Diet was measured using the same single item used in Study 1.

Self-Reported Pro-Environmental Behavior

An adapted version of the Pro-Environmental Behavior Scale (PEB) by Markle (2013) was used which has participants report the environmentally friendly behaviors they carry out in daily life. The scale measures individuals' propensity to engage in behaviors that benefit the environment. Of four subscales, we only used three (i.e., *Conversation*, *Environmental Citizenship*, *Transportation*; e.g., "During the past year how often have you used public transportation?"). We removed the *Food* subscale due to redundancy with our single-item diet measure. We further removed one item of the *Environmental Citizenship* subscale because the relationship between organic produce and sustainability concerns considered in this item is more ambiguous now than when the scale was developed. The overall pro-environmental behavior was computed as an average for all items ($\alpha = .70$).

Donation to an Environmental Charity

We included a single-item measure which informs participants that they have a 1/10 chance of a \$5 bonus and allows them to donate some or all of this money to an environmental charity in increments of \$0.50 (0 = *Keep the \$5.00*, 5 = *Donate \$2.50*, 10

= *Donate \$5.00*). At the end of the study, participants were debriefed that the donation was not actually made.

Covariates

We used the same items as in [Study 1](#) to measure political ideology. We further added one item asking participants' total combined income last year. Income was winsorized at + / -2.5 standard deviations. Moreover, we included the Ten-Item Personality Inventory (TIPI) by [Gosling et al. \(2003\)](#) which includes ten statements (rated from 1 = *Disagree strongly* to 7 = *Agree strongly*), such as "I see myself as extraverted, enthusiastic". Five two-item subscales measure Big 5 agreeableness, conscientiousness, emotional stability, extraversion, and openness to experience. Spearman-Brown coefficients ranged between $r = .41$ for agreeableness and $r = .76$ for emotional stability.

Results

Preregistered Analyses

As predicted, participants who scored higher on cooperative world belief scored higher on both self-reported ethically-minded consumer behavior, $r = .25$, 95% CI [0.17, 0.32], $p < .001$, and pro-environmental behavior, $r = .17$, 95% CI [0.09, 0.24], $p < .001$. Those who scored higher on hierarchical world belief scored lower on self-reported ethically-minded consumer behavior, $r = -.21$, 95% CI [-0.29, -0.13], $p < .001$, and pro-environmental behavior, $r = -.16$, 95% CI [-0.24, -0.08], $p < .001$. A series of regression analyses found that these associations were robust to controlling for three preregistered covariates: sex, political ideology, and income (all $|\beta| > .15$, all p 's $< .001$, [Tables S6 and S7, Hämpke et al. \(2024\)](#)).

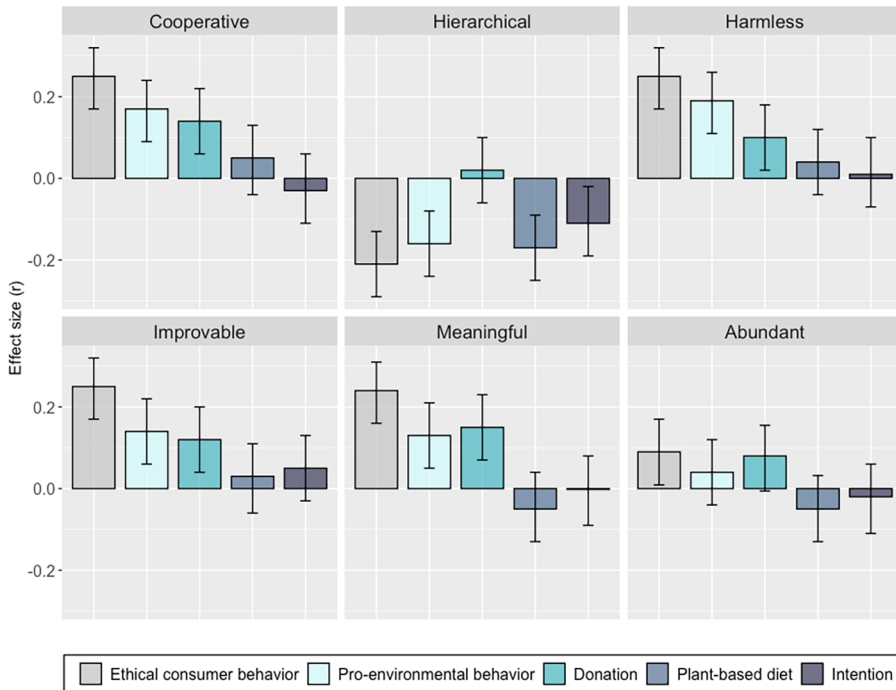
We also tested whether abundant belief moderated the correlations between primals and self-reported sustainable behaviors (H3), as they had in [Study 1](#). Contrary to preregistered predictions, abundant world belief did not moderate the effect of good, harmless, hierarchical, or cooperative world beliefs on self-reported ethically-minded consumer behavior or pro-environmental behavior, all $ps > .106$. The only significant interaction effects were found for improvable x abundant on self-reported pro-environmental behavior, $b = 0.05$, 95% CI [-0.10, 0.00], $p = .038$, and for meaningful x abundant on self-reported pro-environmental behavior, $b = -0.04$, 95% CI [-0.08, -0.01], $p = .025$. These interactions were both in the same direction as those observed in [Study 1](#), such that effects were stronger at low levels of abundant (-1 SD).

Exploratory Analyses

Are World Beliefs Correlated to Other Self-Reported and Direct Measures of Sustainable Behaviors? – Cooperative world belief positively correlated with donation behavior, $r = .14$, 95% CI [0.06, 0.22], $p < .001$, even when controlling for sex,

Figure 1

Correlations between Primal World Beliefs and (Self-Reported) Sustainable Behaviors



political ideology, and income. Hierarchical world belief was the only primal negatively associated with plant-based diet, $r = -.17$, 95% CI [-0.26, -0.11], $p < .001$, and intention to become vegetarian among non-vegetarians, $r = -.11$, 95% CI [-0.19, -0.02], $p = .012$. These associations remained robust even when controlling for age, income, and political ideology (see Tables S6 and S7, Hämpke et al., 2024, for regression analyses). Correlations between the other primals (i.e., improvable, harmless, meaningful, abundant, and good world beliefs) and self-reported ethically-minded consumer behavior, pro-environmental behavior, and donation behavior were mostly significant except for the association between abundant world belief and self-reported pro-environmental behavior and donation behavior. Correlations between primals and the different facets of sustainable behavior are presented in Figure 1 and Supplementary Table S8, Hämpke et al. (2024).

Do Primals Add Explanatory Value in Self-Reported Sustainable Behaviors Beyond Personality Traits? — A series of exploratory regression analyses tested whether

these six primals predict self-reported ethically-minded consumer behavior and pro-environmental behavior even when controlling for Big Five traits. To compare explanatory power, we compared: (a) a model with the six focal primals as predictors to, (b) a model with all Big Five traits, and (c) a model which combined all 11 variables (Table S9, Hämpke et al., 2024).

Compared to Big Five traits, the six focal primals were superior predictors of self-reported ethically-minded consumer behavior and pro-environmental behavior. While 22% of variance (adjusted for number of variables) in self-reported ethically-minded consumer behavior was explained by the primals + personality model, these six primals alone explained 17%, and personality alone explained 11%. We also compared Bayesian Information Criteria (BICs) across models, since BICs balance the trade-off between complexity and goodness of fit by penalizing additional parameters more harshly than alternative measures (e.g., adjusted r^2). BICs for the primals + personality model had the best fit (i.e., lowest values) for ethically-minded consumer behavior, while the personality-alone model performed worst.

Regarding self-reported pro-environmental behavior, the six primals alone explained 7% of variance, while personality alone explained 5% while 10% was explained by the combined model. BICs suggested that the primals model performed best, while the personality model and the primals + personality model yielded similar fits.

A series of exploratory moderation analyses testing interactions between each of six primals with each of five personality traits found no statistically significant interactions for either self-reported PEB or ethically-minded consumer behavior (all p 's > .05 without familywise correction).

Do Primals Add Explanatory Value in Self-Reported Sustainable Behaviors Beyond Personality Traits and Demographics? — As shown in Table 2, an omnibus model including the six focal primals, all Big Five traits, plus political ideology, religiosity, age, sex, level of education, and income, explained 27% of variance in self-reported ethically-minded consumer behavior, with unique associations for four primals (all except cooperative and harmless) and three Big Five traits (all except emotional stability and extraversion), as well as political ideology and religiosity.

An omnibus model with the six focal primals, personality traits, and covariates (political ideology, religiosity, age, sex, level of education, and income) explained 15% of variance in self-reported pro-environmental behavior (Table 3). This model included unique associations for two primals (hierarchical and abundant), but just one personality trait (openness).

Do Specific Primals Add Explanatory Value in (Self-Reported) Sustainable Behaviors Beyond General Positivity? — Finally, we tested whether the predictive utility of primals for self-reported and non-self-reported sustainable behaviors could be

Table 2*Regression Model Predicting Self-Reported Ethically-Minded Consumer Behavior in Study 2*

Effect	<i>b</i>	SE <i>b</i>	β	95% CI		<i>p</i>
				<i>LL</i>	<i>UL</i>	
(Constant)	1.90***	0.23		1.45	2.35	< .001
Abundant	-0.18***	0.04	-0.19	-0.27	-0.09	< .001
Cooperative	0.00	0.04	0.00	-0.08	0.09	.959
Harmless	0.07	0.04	0.10	-0.01	0.15	.068
Hierarchical	-0.18***	0.03	-0.21	-0.24	-0.11	< .001
Improvable	0.20***	0.05	0.21	0.12	0.29	< .001
Meaningful	0.07*	0.04	0.10	0.00	0.14	.044
Extraversion	0.04	0.02	0.07	0.00	0.07	.082
Agreeableness	0.08**	0.03	0.12	0.02	0.13	.005
Conscientiousness	0.08**	0.03	0.13	0.03	0.13	.003
Emotional Stability	-0.04	0.02	-0.08	-0.09	0.00	.069
Openness	0.07**	0.03	0.11	0.02	0.12	.006
Conservatism	-0.13***	0.02	-0.26	-0.17	-0.09	< .001
Religiosity	0.02*	0.01	0.10	0.00	0.04	.019
Age	0.00	0.00	0.04	0.00	0.01	.371
Sex_female ^a	-0.01	0.06	-0.01	-0.14	0.11	.840
Educational level	0.02	0.02	0.05	-0.02	0.06	.241
Personal income ^b	0.04	0.04	0.04	-0.04	0.11	.299

Note. Adjusted model $R^2 = .27$, $F(17, 564) = 13.50$, $p < .001$. CI = Confidence Interval; *LL* = Lower Limit; *UL* = Upper Limit.

^a In this regression analysis, data from female and male participants were analyzed only.

^b Income was z-scored and winsorized at ± 2.5 SD.

* $p < .05$. ** $p < .01$. *** $p < .001$.

accounted for by people holding generally positive worldviews. We first regressed our five measures of sustainable behaviors on the good world belief. Then, we added the six primals as covariates and tested for significant changes in explained variance. The analyses revealed that all of the focal primals other than harmless and cooperative world beliefs (i.e., improvable, hierarchical, meaningful, and abundant) were still significant predictors for self-reported ethically-minded consumer behavior, $-0.27 < \beta < 0.16$, $ps < .012$ (Table S10, Hämpke et al., 2024). However, for self-reported pro-environmental behavior, hierarchical and abundant world beliefs alone were predictive when controlling for good world belief, $b = -0.09$, 95% CI $[-0.14, -0.05]$, $\beta = -0.17$, $p < .001$, and $b = -0.14$, 95% CI $[-0.23, -0.07]$, $\beta = -0.23$, $p < .001$, respectively. Regarding donation behavior, the six primals did not add explanatory value beyond good world belief. Considering

Table 3*Regression Model Predicting Self-Reported Pro-Environmental Behavior in Study 2*

Effect	<i>b</i>	SE <i>b</i>	β	95% CI		<i>p</i>
				<i>LL</i>	<i>UL</i>	
(Constant)	2.53***	0.16		2.21	2.84	< .001
Abundant	-0.08*	0.03	-0.12	-0.14	-0.02	.015
Cooperative	0.00	0.03	-0.01	-0.06	0.05	.911
Harmless	0.05	0.03	0.10	-0.01	0.10	.087
Hierarchical	-0.10***	0.02	-0.18	-0.14	-0.05	< .001
Improvable	0.06	0.03	0.09	-0.01	0.12	.078
Meaningful	0.03	0.03	0.06	-0.02	0.08	.291
Extraversion	0.02	0.01	0.05	-0.01	0.04	.287
Agreeableness	0.03	0.02	0.06	-0.01	0.06	.201
Conscientiousness	0.03	0.02	0.09	0.00	0.07	.065
Emotional Stability	0.00	0.02	-0.01	-0.03	0.03	.896
Openness	0.05**	0.02	0.12	0.01	0.09	.006
Conservatism	-0.06***	0.01	-0.18	-0.08	-0.03	< .001
Religiosity	0.02**	0.01	0.12	0.01	0.03	.006
Age	0.00	0.00	-0.10	-0.01	0.00	.025
Sex_female ^a	-0.09	0.04	-0.09	-0.18	0.00	.042
Education level	0.02	0.01	0.07	0.00	0.05	.086
Personal income ^b	0.04	0.03	0.07	-0.01	0.09	.137

Note. Adjusted model $R^2 = .15$, $F(17, 570) = 6.99$, $p < .001$. CI = Confidence Interval; *LL* = Lower Limit; *UL* = Upper Limit.

^a In this regression analysis, data from female and male participants were analyzed only.

^b Income was z-scored and winsorized at + / - 2.5 *SD*.

* $p < .05$. ** $p < .01$. *** $p < .001$.

plant-based diet, hierarchical and abundant but neither the other four primals nor the good world belief predicted were predictive, $b = -.12$, 95% CI [-0.18, -0.07], $\beta = -0.19$, $p < .001$, and $b = -.10$, 95% CI [-0.18, -0.01], $\beta = -0.13$, $p = .029$, respectively. The intention to become vegetarian among non-vegetarians was predicted by cooperative, hierarchical, and abundant beyond good world belief, $b = -3.74$, 95% CI [-6.70, -0.78], $\beta = -0.16$, $p = .014$, $b = -3.52$, 95% CI [-5.74, -1.30], $\beta = -0.14$, $p = .002$, and $b = -3.76$, 95% CI [-7.16, -0.36], $\beta = -0.13$, $p = .030$, respectively.

Discussion

Study 2 found that several primals predicted sustainable behaviors across different self-report and behavioral measures, with at least two remaining significant after controlling

for Big Five traits, ideology, and demographics. However, we were unable to replicate the moderations of some of these relationships by abundant world belief observed in Study 1. Exploratory research revealed that the six primals explained somewhat more variance in self-reported sustainable behaviors than a short measure of Big Five traits. Models which also included demographics still found unique associations with at least two primals (i.e., abundant and hierarchical) adding more explanatory variance in these outcomes. Further, although good world belief tempered some associations between the six primals and self-report and behavioral measures of sustainable behavior, at least two primals added explanatory value in the self-reported measures beyond good world belief. This suggests that the specific belief content of these primals is important.

Study 3

Studies 1 and 2 identified six focal primals—cooperative, harmless, improvable, meaningful, abundant, and lower hierarchical world beliefs—as correlates of self-reported and actual sustainable behaviors. In Study 3, we aimed to explore causal relationships between primals and people's intention to engage in pro-environmental behavior.

We used a mixed design to examine the relationship between primals and pro-environmental behavior intentions. In addition to testing correlations between primals and pro-environmental behavior intentions, we used within-subject changes in world beliefs over a three-week period to test whether changes in these beliefs were related to changes in individuals' propensity to engage in sustainable behaviors. We also aimed to manipulate cooperative world belief via a social exclusion experiment to determine its causal effect on pro-environmental behavior intentions. Previous research has already showed that the experience of social exclusion can lead to changes in individuals' world views (e.g., Graeupner & Coman, 2017; Lin, 2023). As group membership can lead to higher levels of cooperation, while social exclusion can result in less pro-social behavior (Goette et al., 2006; Twenge et al., 2007), we hypothesized that feelings of social exclusion could temporarily reduce participants' belief in a cooperative world.

Specifically, we made the following predictions (see Hämpke & Kerry, 2024):

H1: Cooperative, improvable, harmless, meaningful, and abundant world beliefs will be positively related to pro-environmental behavior intentions, while hierarchical world belief will be negatively related.

H2: Increases in cooperative, meaningful, harmless, improvable, and abundant world beliefs and decreases in hierarchical beliefs will be associated with positive changes in the propensity to engage in sustainable behaviors (the relative difference between pro-environmen-

tal behavior at Time 1 and pro-environmental behavior intentions at Time 2).

H3: People who are socially excluded (vs. included) are less likely to report pro-environmental behavior intentions. If this is the case, cooperative world belief mediates this relationship.

Method

Participants and Procedure

Initially, we invited all participants from Study 2 to participate to examine changes over a three-week timeframe. When recruitment of this group stopped progressing (we recruited 256 from the original sample), we continued collecting data from new US-American participants until we reached our preregistered 600 participants allowing us to detect small correlations of $r = .15$ with 95% power and small between-subject effects of $d = .20$ with 80% power. Overall, 603 paid participants took part in our study and were paid \$1.60 for their participation (median completion time was 7 minutes). 17 were excluded due to failing an attention check, leaving 586 American participants (337 male, 243 female, 6 not specified), ages 18–81, $M = 39.47$; $SD = 13.30$. 248 of them have already taken part in Study 2 and their data was used in analyses of change over time. Data from all 586 participants was used for the cross-sectional correlations and experimental analyses. Of these, 8% were African-American or Black, 76% Caucasian, 6% Spanish, Hispanic, or Latino, less than 0.5% American Indian or Alaskan Native, less than 0.5% Middle Eastern, and 9% Asian, while 2% of the participants did not report ethnicity. On average, participants reported earning \$53,902 per year ($SD = \$59,939$, min = \$0, max = \$900,000).

To manipulate participants' cooperative world belief, they first played an online ball tossing game called Social Ball which was designed to study ostracism (Meral et al., 2022). In this animated game, participants play a ball game with two other (fictitious) virtual players in which they are either included in or excluded from the game.

When starting the survey, participants were told that they would play an online ball tossing game with two other participants to train their mental visualization skills. To improve credibility, we asked them to wait in the digital lobby until they are matched to two other participants. Following Dvir et al. (2019), we asked participants to mentally visualize the entire experiences during the game including themselves, the other players, and the location. In contrast to former studies that included this game, we also told them to pass the ball as fast as possible (by clicking on another avatar). At the end of the game, a series of questions regarding their visualization experiences followed to improve believability (e.g., "During the task you were asked to mentally visualize the other players. In the space below, please describe briefly what you imagined.").

Participants then proceeded to the main questionnaires.

Measures

Primal World Beliefs — As in Study 2, we used subscales of the 99-item Primals Inventory (PI-99, Clifton et al., 2019) to measure cooperative, meaningful, harmless, improvable, abundant, and hierarchical world beliefs. A change score for primals was computed by subtracting scores for each primal in this study from scores in Study 2 measured three weeks prior for participants who completed both. Reliabilities for the primals and their change scores ranged between $\alpha = .82-.93$ and $\alpha = .55-.72$, respectively (Table S11, Hämpke et al., 2024).

— Self-Reported Sustainable Behaviors —

Pro-environmental Behavior Intentions

The “Pro-environmental Intentions Scale” (Clark et al., 2019) has participants rate 12 statements on their intentions to behave in a more environmentally friendly way in the future (1 = *Strongly disagree*; 5 = *Strongly agree*), e.g., “In the future I will look for ways to reuse things” ($\alpha = .89$).

Results

Preregistered Analyses

As predicted (H1), cooperative, $r(584) = .17$, 95% CI [0.09, 0.24], $p < .001$, improvable, $r(584) = .21$, 95% CI [0.13, 0.28], $p < .001$, harmless, $r(584) = .18$, 95% CI [0.10, 0.25], $p < .001$, meaningful, $r(584) = .14$, 95% CI [0.06, 0.22], $p < .001$, and abundant world beliefs, $r(584) = .09$, 95% CI [0.01, 0.17], $p = .032$, were all significantly positively correlated with pro-environmental behavior intentions, while hierarchical world belief was negatively correlated, $r(584) = -.27$, 95% CI [-0.34, -0.19], $p < .001$. Supplementary Tables S12 and S13, Hämpke et al. (2024), show descriptive statistics and correlations between Study 3’s focal variables. A non-preregistered model including all six focal primals as predictors accounted for 13% of variance (adjusted R^2) in pro-environmental behavior intentions.

Regarding H2, our preregistration indicated that we would examine correlations between changes in people’s propensity to engage in sustainable behaviors and these six primals world beliefs. While results were largely consistent with predictions, it is questionable whether change can be computed across two different measures (self-reported pro-environmental behavior and pro-environmental behavioral intentions). We therefore report these analyses in Supplement S14, Hämpke et al. (2024). Perhaps a better question to ask is whether changes in primal world beliefs are associated with pro-environmental behavior intention at a later timepoint when controlling for earlier self-reported pro-environmental behavior (not preregistered). As shown in Table 4, changes in cooperative and harmless world beliefs were significant predictors of pro-environmental behavior intentions even when controlling for earlier self-reported pro-environmental behavior.

Table 4*Regression Models Predicting Pro-Environmental Behavior Intentions in Study 3*

Model	Effect	<i>b</i>	SE <i>b</i>	β	95% CI		<i>p</i>
					<i>LL</i>	<i>UL</i>	
1	(Constant)	1.37***	0.23		0.92	1.83	< .001
	Cooperative change	0.12*	0.05	0.13	0.02	0.21	.015
	PEB _{ti}	0.76***	0.08	0.53	0.61	0.92	< .001
2	(Constant)	1.39***	0.23		0.93	1.85	< .001
	Meaningful Change	0.08	0.05	0.09	-0.02	0.17	.115
	PEB _{ti}	0.76***	0.08	0.53	0.60	0.92	< .001
3	(Constant)	1.50***	0.23		1.05	1.95	< .001
	Harmless change	0.14**	0.05	0.15	0.04	0.25	.005
	PEB _{ti}	0.72***	0.08	0.50	0.57	0.88	< .001
4	(Constant)	1.43***	0.23		0.98	1.89	< .001
	Improvable change	0.10	0.05	0.11	0.00	0.20	.055
	PEB _{ti}	0.74***	0.08	0.52	0.59	0.90	< .001
5	(Constant)	1.46***	0.23		1.01	1.91	< .001
	Abundant change	0.11	0.06	0.10	0.00	0.22	.057
	PEB _{ti}	0.74***	0.08	0.51	0.58	0.89	< .001
6	(Constant)	1.45***	0.23		0.99	1.91	< .001
	Hierarchical change	-0.05	0.05	-0.05	-0.15	0.05	.342
	PEB _{ti}	0.74***	0.08	0.51	0.58	0.89	< .001

Note. Adjusted model $R^2_{model1} = .28$, $F(2, 245) = 47.75$, $p < .001$. Adjusted model $R^2_{model2} = .26$, $F(2, 245) = 45.37$, $p < .001$. Adjusted model $R^2_{model3} = .28$, $F(2, 245) = 49.09$, $p < .001$. Adjusted model $R^2_{model4} = .27$, $F(2, 245) = 46.20$, $p < .001$. Adjusted model $R^2_{model5} = .27$, $F(2, 245) = 46.16$, $p < .001$. Adjusted model $R^2_{model6} = .26$, $F(2, 245) = 44.29$, $p < .001$. CI = Confidence Interval; *LL* = Lower Limit; *UL* = Upper Limit. PEB_{ti} = Self-reported pro-environmental behavior measured in Study 2.

* $p < .05$. ** $p < .01$. *** $p < .001$.

For the other four world beliefs, effects were directionally consistent with previous findings, but nonsignificant.

Contrary to H3, participants who were socially excluded in Social Ball did not differ from those who were not excluded in terms of either pro-environmental behavior intentions, $t(584) = 0.04$, $p = .485$, $d = 0.003$, 95% CI [-0.16, 0.17], or cooperative world beliefs, $t(584) = .54$, $p = .294$, $d = 0.045$, 95% CI [-0.12, 0.21].

Exploratory Analyses

Manipulation checks indicated that the experiment was successful in making participants feel socially excluded (see S15). Analyses testing whether the focal primals moderated

experimental effects of social exclusions on pro-environmental intentions found no significant interactions (all p 's > .05).

Discussion

Consistent with preregistered predictions, Study 3 found that the six focal primals—beliefs that the world is more cooperative, meaningful, improvable, harmless, and abundant, but less hierarchical—were associated with stronger pro-environmental behavior intentions. In a pattern mirroring the cross-sectional relationships, changes over a three-week period in cooperative and harmless world beliefs were correlated with pro-environmental behavior intentions even when controlling for earlier self-reported pro-environmental behavior. However, an experimental manipulation of social exclusion was not successful in changing either cooperative world belief or pro-environmental behavioral intentions.

General Discussion

Three studies found consistent evidence that primal world beliefs correlated with both (self-reported) sustainable behaviors and behavioral intentions. In particular, we identified six beliefs—beliefs that the world is less hierarchical, but more cooperative, meaningful, abundant, improvable, and harmless—which were associated with self-reported sustainable behaviors. These associations were found to be largely independent of each other and mostly remained robust to controlling for several potential confounds, including social desirability, religiosity, and even political ideology. At least three of the six primals (i.e., abundant, harmless, and hierarchical) added significantly explanatory value in self-reported sustainable behaviors beyond Big Five traits.

The overall explanatory power of these six primals was substantial, accounting for 17% of adjusted variance in self-reported ethically-minded consumer behavior and 7% of self-reported pro-environmental behavior in Study 2. This meant that the six focal primals explained more variance in these two outcome variables than Big Five traits. While this could be explained by the use of a short version of the Big Five Inventory, which may have inflated measurement error, the correlations between pro-environmental behavior and Big 5 traits in Study 2 were comparable to those reported in other studies (see Soutter et al., 2020). Further, the relationships between primals and these two self-reported measures of sustainable behavior were not explained by shared variance between primals and Big Five traits—a model with primals and personality traits together explained 22% of variance in self-reported ethically-minded consumer behavior—suggesting that these six primals offer considerable predictive utility that cannot be accounted for by Big Five factors. Findings thus provide additional evidence that primal world beliefs are not merely a function of one's personality traits, at least according to the

Big Five taxonomy (Clifton et al., 2019), and that this difference matters, in this case explaining considerable additional variance in self-reported sustainable behaviors.

Several of the associations between the six primals and self-reported and actual sustainable behaviors became non-significant when controlling for the good world belief. For the donation measure, none of the lower-level primals emerged as significant predictors when good world belief was accounted for. This observation is consistent with previous findings suggesting that the overall belief in a good world accounts for a large amount of the shared variance between specific primals and some traits (Stahlmann & Ruch, 2023). A certain amount of this redundancy is perhaps unsurprising, given that five of these six primals are considered lower-level facets of good world belief (with which they covary strongly), and that cooperative and harmless belief, in particular, share several items with this broader construct (Clifton et al., 2019). Further, adding the six primals as predictors resulted in increased variance explained in the different self-reports of sustainable behaviors. The lower-order primal that was most consistently associated with self-reported sustainable behaviors independent of good world belief was hierarchical world belief.

We were unable to successfully manipulate cooperative world belief in Study 3, meaning that the exact nature of the causal relationship between primal world beliefs and sustainable behaviors remains unclear. It is possible that the experimental manipulation was simply too brief or insufficiently psychologically potent to move cooperative belief (and consequently sustainable behavioral intentions) successfully. According to previous research, world beliefs tend to be stable and show only modest relationships with recent events (Clifton et al., 2019; Kerry et al., 2024; Ludwig et al., 2023). Thus, perhaps subtle online manipulations such as Social Ball are not sufficiently impactful to meaningfully change world beliefs.

Although we found no direct evidence of causal relationships, the within-subjects data in Study 3 indicated that changes in at least two primals (cooperative and harmless world beliefs) predicted pro-environmental behavior intentions beyond previously self-reported pro-environmental behavior. This finding suggests that increases or decreases in primal world beliefs over time may be somehow tied to individuals' propensity to engage in pro-environmental behaviors.

Although the findings here are largely novel, several aspects are theoretically consonant with existing work. For example, the finding that meaningful world belief correlates with self-reported sustainable behaviors is consistent with research showing links between pro-environmental behavior and people's need for meaning (Lin, 2019; Scales et al., 2014; van Tilburg & Igou, 2011). Similarly, the importance of hierarchical world beliefs for self-reported sustainable behaviors is consistent with research showing that pro-environmental attitudes and attitudes towards vegetarianism are predicted by social dominance orientation, a measure of people's preferences for hierarchically structured social organizations (Dhont & Hodson, 2014; Milfont et al., 2018; Panno et al., 2018; Zhao

et al., 2018). It is worth noting, in this context, that hierarchical world belief is both theoretically and empirically distinct from social dominance orientation. Hierarchical world belief describes how things are perceived to be rather than how they should be, and while the two variables are related, correlations do not indicate redundancy (e.g., $r = .29$ in Prokosch et al., 2022 and $r = .42$ in Clifton & Kerry, 2023).

Limitations

There are several limitations to consider in this study. First, although world beliefs have been widely theorized to influence attention, personality, and behavior (e.g., Beck, 1963, 1964), we should not assume causal directionality from the correlational findings presented here or that interventions which increase specific primals will necessarily increase attitudes or behaviors which covary with them. Borsboom and colleagues (2009) have made this point, noting that it is possible for drinking coffee to be negatively related to neuroticism, but that an intervention that asks people to drink a lot of coffee could still increase neuroticism (perhaps because people who are lower in neuroticism are more likely to consume something with the potential to make them more anxious). More focused longitudinal or intervention-based research is needed to test causal relationships, their directions, and the conditions under which these relationships exist. However, there are some theoretical reasons to hypothesize certain directional relationships. For example, it makes more sense to try to make positive changes in a world which is easy to improve (high improvable beliefs), where others will do their bit (high cooperative beliefs), and where the world and the things we do really matter (high meaningful beliefs). And one might be less concerned about policies that are perceived to primarily harm lower-status people, poorer countries, and non-human animals if you believe that some people, groups, and animals are just better and more important than others (high hierarchical beliefs).

A second limitation is that, given our use of self-reports of sustainable behaviors, we can only draw conclusions about the relationship between primals and individuals' propensity to engage in sustainable behaviors but not about actual behavior, as self-reports may differ from actual behaviors for a variety of reasons (see Lange et al., 2023). While we did find that hierarchical beliefs correlated with donation behavior, this represents a rather contrived example, and the use of more direct measures (e.g., digital traces of buying behavior) is needed to draw firm conclusions on the relevance of primals in sustainable behaviors.

A third limitation concerns the measurement of ethical diet. We did not distinguish between participants who decided to be vegan or vegetarian due to ethical or health reasons (Radnitz et al., 2015). Although findings revealed that more than 80% of vegetarians across the world decided to avoid animal products due to animal welfare or for the environment (Veggly, 2021; Vomad, 2019), differential associations with behavior due to diverse motivations should be investigated in future research.

Lastly, we derived our results from university students and paid online samples of American adults only. Future work may also strive to test generalizability of the present findings among more diverse samples.

Implications

The findings here show that world beliefs explain substantial variance in self-reported sustainable behaviors and that changes in these beliefs may be related to people's pro-environmental behavior intentions even when controlling for previously reported pro-environmental behavior. If it is the case that primals are causally prior to pro-environmental intentions, these beliefs would represent a promising target for interventions. For example, applied research could test whether messaging which emphasizes more cooperative aspects of the wider world and encourages people to see the world as imbued with meaning may be more successful in encouraging sustainable behaviors. Or perhaps people who already see the world as more cooperative, meaningful, or improvable could be more receptive to certain types of messaging (Feinberg & Willer, 2011).

Concluding Remarks

This paper presents evidence that several primals are associated with (self-reported) sustainable behaviors and that increases in cooperative and harmless world beliefs predict pro-environmental behavior intentions beyond previously reported pro-environmental behavior. For several measures, these primals were more powerful predictors than short-form measures of political ideology and personality traits. Given world beliefs' putative role in influencing attention and behavior, future research aimed at uncovering sources of change in these beliefs may offer fresh insight into designing successful interventions and messaging aimed at encouraging sustainable behaviors.

Openness and Transparency Statements

The present article has been checked by its handling editor(s) for compliance with the journal's open science and transparency policies. The completed *Transparency Checklist* is publicly available at:

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Ethics Statement. This research was approved by the Institutional Review Board of the University of Pennsylvania. All participants gave written informed consent in accordance with the Declaration of Helsinki (World Medical Association, 2013). They were asked if understood the instructions and informed that their participation was voluntary, and that they had the right to withdraw from the study at any time. After the end of the study, participants were fully debriefed. All data were anonymized and saved confidentially.

Diversity Statement. In the list below, the check mark (☑) indicates which steps were taken to increase diversity within the context of this paper. Steps that were not taken or did not apply are unmarked (☐).

- Ethnically or otherwise diverse sample(s)
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- Inclusive gender measure
- Inclusive materials
- Sampling justification
- Extensive sample description
- Discussion of generalizability
- Diverse reference list
- Underprivileged / minority author(s)
- Early career author(s)
- Degree of privilege/marginalization considered in authorship order
- Author(s) from sampled population (avoiding 'helicopter science')

Supplementary Materials. The following table provides an overview of the accessibility of supplementary materials (if any) for this paper.

Type of supplementary materials	Availability/Access
Data	
Study data.	Kerry & Hämpke (2024b)
Code	
SPSS code.	Kerry & Hämpke (2024b)
Material	
a. Materials for Studies 1–3.	Kerry & Hämpke (2024b)
b. Measures for Studies 1–3.	Kerry & Hämpke (2024b)
Study/Analysis preregistration	
a. Preregistration of hypotheses—Study 1.	Kerry & Clifton (2022)
b. Preregistration of hypotheses—Study 2.	Kerry & Hämpke (2024a)
c. Preregistration of hypotheses—Study 3.	Hämpke & Kerry (2024)
Other	
Supplementary tables and figures on correlation and reliability, regression analyses, manipulation checks.	Hämpke et al. (2024)

Badges for Good Research Practices.

Open data: YES.

Open code: YES.

Open materials: YES.

Preregistration: YES.

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