

# Profiling the “Pro-Environmental Individual”: A Personality Perspective

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**ABSTRACT** There is considerable scientific interest in the psychological correlates of pro-environmental behaviors. Much research has focused on demographic and social-psychological characteristics of individuals who consistently perform such actions. Here, we report the results of 2 studies in which we explored relations between broad personality traits and pro-environmental actions. Using a wide variety of behavior and personality measures, we consistently found moderate positive relations between Openness to Experience and pro-environmental activities in both a community sample (Study 1:  $N = 778$ ) and an undergraduate student sample (Study 2:  $N = 115$ ). In Study 2, we showed that the effect of Openness on pro-environmental behaviors was fully mediated by individuals' environmental attitudes and connection to nature. Our findings suggest that high levels of aesthetic appreciation, creativity, and inquisitiveness, but not personality traits associated with altruism, may have motivated the performance of pro-environmental actions among our respondents. Implications for intervention development are discussed.

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During the past four decades, environmental psychologists and sociologists have attempted to describe, characterize, and understand the “pro-environmental individual” (PEI). This is the person who demonstrates a pattern of pro-environmental action across many different domains (e.g., energy use, water consumption, transportation, waste reduction). Given the urgency of the ecological crises we currently face, and the role of human decision making in both bringing about and containing those crises, it is critical that we explore the etiology of pro-environmental behavior (PEB) from all available theoretical and methodological perspectives. Unfortunately, extant research presents only a partial portrait of the PEI, largely ignoring the possible role of highly stable individual differences—especially personality characteristics—in shaping environmental decision making. The aim of the present research is to expand our understanding of pro-environmental individuals through an initial exploration of personality-behavior relations.

In attempting to paint a portrait of the PEI, researchers have generally taken one of two approaches. The first focuses on specific behaviors (e.g., transportation to school) and the many factors that influence individuals’ decision making in a given situation. For example, Cialdini and his colleagues (e.g., Cialdini, Reno, & Kallgren, 1990) have consistently demonstrated the influence of situation- and behavior-specific social norms on the performance of various environmentally relevant actions, from the reuse of towels in hotels (Goldstein, Griskevicius, & Cialdini, 2007) to household energy conservation (Nolan, Schultz, Cialdini, Goldstein, & Griskevicius, 2008). Others have examined the importance of factors such as behavior-specific knowledge and attitudes (e.g., Frick, Kaiser, & Wilson, 2004), behavioral intentions, perceived behavioral control (e.g., Oom Do Valle, Rebelo, Reis, & Menezes, 2005), price signals, and characteristics of the environment that act as facilitators or barriers to behavior (e.g., McKenzie-Mohr & Smith, 1999). These and other research efforts have been particularly useful for the development of targeted behavior change interventions.

One limitation of the behavior-focused approach, however, is that it is not well suited to explaining why certain individuals show a consistent pattern of PEB across different behavioral domains while others do not. Understanding what motivates the *tendency* to make pro-environmental decisions, regardless of situational, social, and other external influences on behavior (see Kollmuss & Agyeman,

2002), has been a major focus of research efforts in this field, in part because individuals' environmental actions only have measureable ecological impacts when aggregated across many different behaviors that take place in a wide variety of settings (e.g., in the home, at the office). Thus, there is significant interest among researchers, practitioners, and environmental advocates in uncovering underlying, situationally stable factors that motivate individuals to perform many different types of PEB. To this end, the second major approach to studying PEB focuses on exploring characteristics of individuals that correlate with a general tendency to perform pro-environmental actions.

### **Who Is the Pro-Environmental Individual?**

Pro-environmental individuals have been described in terms of a wide variety of nonbehavioral constructs, including demographic, sociological, and psychological ones. For example, research with U.S. samples reveals that PEIs are more likely to be female, younger, relatively more affluent, and better educated than non-PEIs (see Davidson & Freudenburg, 1996; Hines, Hungerford, & Tomera, 1986/87; Kalof, Dietz, Guagnano, & Stern, 2002; Thøgersen & Olander, 2006; Zelezny, Chua, & Aldrich, 2000). Not surprisingly, PEIs are also more likely than others to hold positive environmental attitudes (e.g., Dunlap, Van Liere, Mertig, & Jones, 2000), be well informed regarding the impact of their actions (Frick et al., 2004), feel efficacious in the environmental domain, and demonstrate concern about the state of the natural world (see Bamberg & Moser, 2007, for a review).

More recently, researchers have turned their attention to a wider range of psychological correlates of PEB, producing significant insights into underlying motives in the process. For example, Mayer and Frantz (2004), Nisbet, Zelenski, and Murphy (2009), and others have shown that individuals who feel a stronger affective connection to nature and who include nature in their self-concept are more likely to be PEIs. In addition, PEIs are relatively more concerned about the impact of environmental problems not only on themselves and their immediate family but also on other, often anonymous, human beings and the broader ecosystem more generally (Schultz, 2001). These findings mesh nicely with related work on the role of environmental identity in engendering pro-environmental action (see Clayton, 2003).

Research on relatively more stable individual differences factors, including values, prosociality, political orientation, and a limited number of personality variables, is further enriching the emerging portrait of the PEI. For example, research on basic values (e.g., honesty, individualism) and PEB consistently reveals that individuals who endorse self-transcendent values (e.g., universalism) are more likely to exhibit such behaviors (e.g., Dietz, Fitzgerald, & Shwom, 2005; Stern, Dietz, Abel, Guagnano, & Kalof, 1999). In a related vein, Cameron, Brown, and Chapman (1998) and others (e.g., Garling, Fujii, Garling, & Jakobsson, 2003; Schultz, 2001, Study 3) have shown that PEIs are relatively more prosocial than non-PEIs, whereas early work by Pratto, Sidanius, Stallworth, and Malle (1994) showed that individuals high in social dominance orientation, which reflects “one’s degree of preference for inequality among social groups” (p. 741), were less likely to support environmental protection policies. Feygina, Jost, and Goldsmith (2010) recently showed that a tendency to support the status quo through justification of current socioeconomic systems and inequalities (i.e., system justification) is negatively related to self-reported performance of various PEBs; that is, high system justifiers tend to perform fewer PEBs. Seemingly in line with these and other findings (see Jost, Glaser, Kruglanski, & Sulloway, 2003), some research also suggests that PEIs are more likely to be ideologically and politically liberal (cf. Allen, Castano, & Allen, 2007; Feygina et al., 2010).

Many of the findings discussed above have been interpreted as supportive of an empathy- or altruism-based account of PEB (Schultz, 2001; Stern, Dietz, Kalof, & Guagnano, 1995). Indeed, it seems highly likely that altruism is an important underlying motivator of pro-environmental action for at least some individuals. However, some of the results presented above point to another potential motivating factor, namely, a willingness to break with convention and try new activities, products, or ways of doing things. For example, younger individuals may be more likely to perform various pro-environmental actions in part because those actions are novel or involve the use of products marketed as the most modern option available. In a related vein, the work by Feygina et al. (2010) suggests that some individuals may perform relatively more pro-environmental behaviors in part because they are willing to challenge conventional ways of acting or consuming goods. These and

other findings suggest that PEIs may be relatively high in the broad personality trait of Openness to Experience (see below).

### Personality and Environmentalism

The findings presented above suggest that relatively stable individual differences factors may play an important, if distal, role in shaping the environmentally relevant behavioral tendencies of individuals. Indeed, while research on traditional personality constructs and environmental behavior is currently limited to more narrowly construed traits (e.g., social dominance orientation, prosocial value orientation, system justification), this research is already improving our understanding of the pro-environmental individual. In addition, recent work exploring relations among the Big Five personality domains (Goldberg, 1993) and various proximal predictors of environmental action, including environmental concern and attitudes, connection to nature, and behavioral goals, has further demonstrated the importance of considering personality in the prediction of PEB. For example, Hirsh (2010; Hirsh & Dolderman, 2007) found that higher levels of Openness to Experience and Agreeableness were significantly positively correlated with increased environmental concern.<sup>1</sup> Considering the previously demonstrated relations of Openness with many of the psychological and demographic factors discussed above (e.g., political liberalism/conservatism, age, system justifying; e.g., Jost et al., 2003), as well as the connection of Agreeableness to empathy and altruism (e.g., Graziano & Habashi, 2010), these initial results seem to provide at least indirect support for both “altruism” and “openness” accounts of environmentalism.

An expansion of the research on PEIs to include more broadly construed and measured personality traits, including domain- and

1. This initial work was conducted with Canadian (2007) and German (2010) samples. More recent results obtained with a British community sample (Swami, Chamorro-Premuzic, Snelgar, & Furnham, 2010) showed that the Big Five traits may be differentially predictive of three distinct domains of environmental concern (not differentiated by Hirsh, 2010), that is, biocentric, egocentric, and anthropocentric/altruistic (see Schultz, 2001; Stern, 2000). Biospheric concern correlated significantly and positively with Agreeableness, Emotional Stability, and Conscientiousness, whereas anthropocentric and egocentric concern did not correlate with any Big Five traits. These divergent findings may reflect cross-cultural differences in personality-environmentalism relations or may simply reflect methodological differences between the various studies that have been conducted.

facet-level constructs (see Goldberg, 1993; John & Srivastava, 1999; Soto & John, 2009), seems warranted, for at least three reasons. First, domain-general personality constructs presumably represent the most basic situationally stable characteristics of individuals that can be used to predict patterns of behavior (Funder, 2007). This level of analysis closely matches that at which we conceptualize the pro-environmental individual, namely, as someone who demonstrates a stable pattern of PEB performance across time, space, and behavioral domains. Second, to the extent that pro-environmentalism stems from stable individual differences, we should expect broad measures of personality to pick up on these differences. Third, examining highly stable individual differences factors may provide more reliable insights into the motivational bases of pro-environmental action than can be gained from more traditionally studied social psychological variables (e.g., attitudes).

That said, one important caveat to consider when examining the predictive validity of domain-level personality traits such as the Big Five (Goldberg, 1993) is that such higher-order constructs are themselves constituted of many lower-level traits and mid-level facets (see John & Srivastava, 1999). These traits may in fact have contradictory or inconsistent effects on behavior in a given domain. In the extreme case, significant and opposing relations at the facet level may effectively offset one another (Soto & John, 2009), making it appear as if there is no relation between a domain-level trait and the construct under study. We explored this possibility in the present research.

### **Predictions and Present Studies**

As discussed above, no previously published research that we are aware of has yet examined the relations of broad personality traits to the performance of pro-environmental behaviors. This represents a significant gap in the literature in this area, as the findings presented above suggest that examining relations between pro-environmental action and a wide variety of domain- and facet-level personality traits may meaningfully help characterize PEIs, potentially shedding light on underlying drivers of PEB. In addition, none of the extant research on the Big Five and environmentalism (Hirsh, 2010; Hirsh & Dolderman, 2007; Swami et al., 2010; Wiseman & Bogner, 2003) has been conducted with U.S. samples, despite the fact that much psychological and sociological research on PEIs has focused on Americans.

Although limited by the scarcity of directly relevant past research, we made a number of predictions regarding the “personality profile” of PEIs, particularly at the domain level. First, as alluded to above, we expected to find a positive relation between PEB and personality traits known to correlate with empathy and altruistic behavior (i.e., Agreeableness), given that converging evidence from a variety of approaches points to the importance of altruism in driving at least some PEBs. Furthermore, altruism has explicitly been identified as one mid-level facet of Big Five Agreeableness (cf. John, Donahue, & Kentle, 1991; see also Soto & John, 2009). In addition, Agreeableness and Conscientiousness from the Big Five and Honesty-Humility from the six-dimensional HEXACO framework (Ashton & Lee, 2007) have all been associated with a tendency to be well socialized or a “good citizen.” At least some individuals may perform PEBs because they view them as “the right thing to do” or as socially acceptable or preferable behaviors. Thus, we predicted that PEIs in our samples would demonstrate relatively higher levels of Agreeableness, Conscientiousness, and Honesty-Humility, as measured by a variety of personality inventories (see below).

That being said, our predictions with respect to Conscientiousness are not quite this simple. We expected that the self-discipline facet of Conscientiousness would be a positive predictor of pro-environmental action (e.g., because such behaviors need to be repeated daily), whereas the order facet would be a negative predictor (e.g., because it is positively related to traditionalism); to the extent that these relations are equally strong (in opposite directions), it is entirely possible that no significant relation between Conscientiousness and pro-environmental action will be observed because order and self-discipline are positively correlated with one another and thus may cancel each other out when combined at the domain level.

We also expected to find a positive relation between the performance of PEB and the broad trait of Openness to Experience, for a variety of reasons. First, facets of Openness to Experience, such as aesthetic appreciation and intellectual curiosity, might influence one’s interest in nature and environmentalism (e.g., Hirsh & Dolderman, 2007). Appreciation for the natural world, which is a predictor of PEB (e.g., Hartig, Kaiser, & Bowler, 2001), may also be related to Openness to Experience facets, especially aesthetic appreciation. Additionally, the findings presented above regarding the relations of

system-justifying tendencies, ideology, and age to PEB all suggest an underlying role for Openness to Experience in motivating many PEIs.

To test these and other predictions (e.g., the existence of a relation between trait anxiety and PEB, the stability of personality-behavior relations across diverse measures of personality and PEB), we carried out two exploratory studies examining the relations among domain- and facet-level personality traits and the performance of pro-environmental action. The first study, which included participants from a large and heterogeneous sample of adults living in a medium-sized U.S. city, employed a relatively simple measure of PEB and a wide variety of commercially and publicly available personality inventories. In addition to providing initial insights into PEB-personality relations, Study 1 permitted an examination of the stability of these relations across many different measures of domain- and facet-level personality traits. The second study, conducted with introductory psychology students at a large U.S. state university, was designed to test the replicability of Study 1 findings using a distinct and more behaviorally diverse measure of PEB. Study 2 also extended this research to examine plausible mediators of personality-PEB relations, as past results suggest that the effects of broad personality traits on the performance of PEB may flow through both direct and indirect pathways; examining whether and how personality-PEB relations are mediated by other psychological processes (e.g., attitudes, connection to nature) will be critical for determining the implications of such relations for both theory building and intervention development in this field. Together, these two studies provide an initial examination of the role that broad personality traits may play in motivating pro-environmental action.

### **STUDY 1: COMMUNITY SAMPLE**

Previous research examining the relation between domain-level personality traits and nonbehavioral environmentalism (Hirsh, 2010; Hirsh & Dolderman, 2007; Swami et al., 2010) has primarily employed two measures of personality, namely, the Big Five Inventory (BFI; John et al., 1991) and the Ten Item Personality Inventory (TIPI; Gosling, Rentfrow, & Swann, 2003). In order to determine the generalizability across instruments of domain- and facet-level

personality predictors of pro-environmental behavior, it is important to examine a number of different personality inventories. In Study 1, we explore the robustness of personality-behavior relations by examining correlations between a short measure of PEB and four major personality inventories.

## Method

### *Participants*

All participants were members of the Eugene-Springfield Community Sample (ESCS), which was recruited by a mail solicitation in 1993 from lists of local homeowners. The participants are heterogeneous on most variables other than racial/ethnic status (virtually all of them are Caucasian), ranging in age from 18 to 85 when recruited in 1993. All levels of educational attainment are represented in the sample. A total of 778 individuals responded to the items that constituted the environmental behaviors measure. Listwise deletion of individuals with missing data was used within each of the three overarching analyses presented below.

### *Measures*

*Personality attributes.* Over the past 10 years, most of the participants have completed a wide variety of measures of personality attributes, including over 2,000 items from the International Personality Item Pool (Goldberg, 1999), administered in many different installments. In addition, the participants have completed a number of commercial personality inventories. In this study, we focus on just four of these: Revised NEO Personality Inventory (NEO-PI-R; Costa & McCrae, 1992); HEXACO Personality Inventory (HEXACO-PI; Lee & Ashton, 2004); Six Factor Personality Questionnaire (6FPQ; Jackson, Paunonen, & Tremblay, 2000); and the Big Five Inventory (BFI; John et al., 1991).

Each of the self-report inventories was sent by mail to the research participants, who returned them personally in preaddressed, postage-paid envelopes. In addition to self-reports, informant ratings on the BFI were obtained by asking participants to give a questionnaire (provided by the researchers) to three individuals who knew them well (e.g., spouse, coworker, friend). Informants filled out a four-page booklet that included the BFI and a number of other measures and returned the survey directly to the researchers in prestamped envelopes. Informant anonymity was guaranteed in a cover letter attached to the booklet. Only identification code numbers were included on all questionnaires; participants were always requested not to indicate their names.

*Environmental behavior.* All participants in the ESCS completed a 400-item behavior inventory, which was initially based on Loehlin and Nichols's (1976) Objective Behavior Inventory. This large pool of items contains specific activities from numerous behavioral domains, including environmentally responsible behaviors. Of the 400 behavioral items, we identified nine that reflect environmentally relevant actions; these were used in constructing a heterogeneous measure of environmental behaviors, which we refer to as the Environmental Practices Scale (EPS) for the sake of convenience. Items were measured using the following scale: (1) *Never in my life*; (2) *Not in the past year*; (3) *Once or twice in the past year*; (4) *Three or more times in the past year, but not more than 15 times (such as once or twice a month)*; (5) *More than 15 times in the past year*.

Although the nine items constituting the EPS (see Table 1) do not reflect all domains of environmentally relevant behavior (Stern, 2000), they do allow an initial examination of the relations between personality and pro-environmental practices. Not unexpectedly in the domain of pro-environmental behavior, the reliability of this nine-item scale was lower than is considered desirable ( $\alpha = .63$ ; see Kaiser, 1998). However, given both the heterogeneity of the behavioral domain itself as well as our inclusion of relatively few items in the EPS, we believe this relatively low level of reliability is of secondary concern.

**Table 1**  
The Items Included in the Environmental Practices Scale  
in Study 1

Behavior	Mean	SD	r Total
Recycled	4.82	.53	.23
Used both sides of a piece of paper before discarding it	4.31	.95	.25
Picked up litter that wasn't mine	3.68	.72	.26
Walked, biked, rode the bus, or carpooled instead of driving somewhere	3.61	1.05	.46
Bought organic food (not sprayed with pesticides)	3.08	1.12	.42
Composted food scraps or yard waste	3.07	1.51	.27
Used public transportation	2.85	.97	.32
Changed a habit so I would have less impact on the environment	2.51	.75	.32
Rode a bicycle to work	1.86	.94	.36

*Note.*  $N = 778$ .

## Results

### *Demographic Characteristics of the Sample*

Age, gender, and education distributions of all subsamples used (due to missing data) closely matched those of the total sample. Women constituted 58% of the ESCS, and the average age of participants was 51.3 years ( $SD = 12.7$ ). The average participant had completed 2 years of postsecondary schooling.

### *Internal Properties of the Environmental Practices Scale*

The nine behavioral items included in the EPS are listed in Table 1, along with their means, standard deviations, and correlations with the item-corrected scale. The items varied significantly in their frequencies of occurrence, from a low of 1.86 (rode a bicycle to work) to a high of 4.82 (recycled). A principal components analysis of the nine items was conducted. Examination of the scree plot suggested a single dominant dimension (which explained 27% of the variance). Scores on the EPS, calculated as the average of responses across the nine items, were normally distributed with a mean of 3.31 ( $SD = .50$ ); mean EPS scores did not differ significantly between the total sample and subsamples used in the analyses reported below.

### *Demographic Correlates of Environmental Behaviors*

Scores on the EPS were negatively correlated with age,  $r(639) = -.18$ ,  $p < .001$ , in line with previous research on environmental behaviors. Similarly, education was positively correlated with the EPS,  $r(639) = .27$ ,  $p < .001$ . However, men ( $M = 3.31$ ,  $SD = .49$ ) and women ( $M = 3.32$ ,  $SD = .51$ ) did not differ significantly on the EPS,  $t(639) = .37$ ,  $p = .71$ . We also found a moderate correlation between the EPS and the Reasoning scale of the Sixteen Personality Factor Questionnaire, which is a brief maximum-performance test of intelligence,  $r(639) = .28$ ,  $p < .001$ .

### *Personality Correlates of the Environmental Practices Scale*

We next examined the relations of the EPS with a number of widely used and well-validated personality inventories. Our analysis of personality correlates proceeded in three steps. First, we examined zero-order and partial correlations between the EPS and the domain

**Table 2**  
**Environmental Practices Scale Zero-Order and Partial**  
**Correlations With the Revised NEO Personality Inventory, the**  
**HEXACO Personality Inventory, and the Six Factor Personality**  
**Questionnaire Domain Scores in Study 1**

Inventory-Domain	Zero Order	Partial
NEO-Openness	.39***	.34***
NEO-Extraversion	.11*	.12**
NEO-Agreeableness	-.01	.06
NEO-Conscientiousness	-.01	-.04
NEO-Emotional Stability	-.05	.00
HEXACO-Openness	.45***	.38***
HEXACO-Extraversion	.15**	.11*
HEXACO-Agreeableness	.06	.08
HEXACO-Conscientiousness	.03	.01
HEXACO-Emotionality	-.07	.00
HEXACO-Honesty-Humility	.03	.07
6FPQ-Openness	.37***	.31***
6FPQ-Extraversion	.07	.02
6FPQ-Agreeableness	.06	.05
6FPQ-Industriousness	.13**	.10*
6FPQ-Methodicalness	-.14**	-.14**
6FPQ-Independence	.10*	.06

*Note.* NEO = Revised NEO Personality Inventory; HEXACO = HEXACO Personality Inventory; 6FPQ = Six Factor Personality Questionnaire. Partial correlations control for age, education, and intelligence. Values reported are based on a complete subsample of participants,  $n = 493$ . \* $p \leq .05$ . \*\* $p \leq .01$ . \*\*\* $p \leq .001$ .

scores of three widely used personality inventories:<sup>2</sup> NEO-PI-R, HEXACO-PI, and 6FPQ. Domain-level correlations with the EPS are shown in Table 2 for the subsample of individuals who had complete data on these measures ( $n = 493$ ).<sup>3</sup> Across these

2. We limited the number of personality inventories reported in this article to keep the number of findings manageable. Analyses of the scales in other personality inventories returned consistently similar results.

3. Throughout the article, we report values based on the complete subsample for a given analysis (e.g., all participants who had complete domain-level personality and control variable data). However, values based on the total sample using pairwise deletion within analyses ( $n$  ranging from roughly 550 to 675) were always within .04 of the values reported here. More important, there were no substantive differences between values obtained using pairwise and listwise deletion (e.g., significant results becoming insignificant and vice versa).

three inventories, a clear picture emerged: performance of pro-environmental behaviors, as measured by the EPS, was strongly correlated with the broad trait of Openness to Experience and was also weakly correlated with Extraversion. Partialing out the effects of age, education, and intelligence only slightly attenuated these relations. However, the Extraversion-EPS relation, as well as the small but significant correlations of the EPS with the 6FPQ domains of Methodicalness (negative), Industriousness, and Independence (both positive) all became nonsignificant when we controlled for Openness.

To further probe the stability and nature of these relations, we next examined zero-order and partial correlations between the EPS and the facet scores for each of the three personality inventories listed above. Significant facet-EPS correlations are shown in Table 3 (for the same subsample as used above,  $n = 493$ ), along with the partial correlations after controlling for age, education, and intelligence. As with the domain scores, facets tapping Openness to Experience clearly correlated most strongly with the EPS. The 10 highest correlates of the EPS were all Openness facets, followed by a mixture of Extraversion, Industriousness, Agreeableness, and Conscientiousness facets. A number of facets also correlated negatively with the EPS; these facets seem to primarily tap certain dimensions of Conscientiousness. Controlling for age, education, and intelligence again seemed to have a minimal effect on personality-EPS correlations.

In these analyses, both the personality inventories and the EPS were self-reported. In the third step of our analysis, we examined the relations between the EPS and both self- and informant-reported scores on the BFI. If informant reports of personality show similar patterns of correlation as self-reported measures, this provides even stronger support for the robustness of the findings above. Table 4 shows zero-order correlations of BFI domain and facet scores (Soto & John, 2009) with the EPS, for both the self-reported and informant-reported BFI. (Most participants had more than one informant provide BFI ratings; when this was the case, informant ratings were averaged prior to running the EPS analysis.) Again, we found a significant correlation between Openness to Experience and the EPS. However, no significant relation with Extraversion emerged at the domain level, although we did find a statistically significant correlation with the activity facet (replicating the NEO-PI-R/HEXACO-PI/6FPQ facet-level analyses reported above).

**Table 3**  
**Significant Correlations of the Environmental Practices Scale**  
**With Facet Scores From the Revised NEO Personality Inventory,**  
**the HEXACO Personality Inventory, and the Six Factor**  
**Personality Questionnaire in Study 1**

Inventory-Domain	Facet	Zero Order	Partial
HEXACO-Openness	Aesthetics	.42***	.39***
6FPQ-Openness	Breadth of interest	.37***	.31***
HEXACO-Openness	Inquisitiveness	.34***	.27***
NEO-Openness	Aesthetics	.33***	.32***
HEXACO-Openness	Unconventionality	.33***	.26***
6FPQ-Openness	Understanding	.31***	.24***
NEO-Openness	Ideas	.30***	.21***
NEO-Openness	Actions	.29***	.30***
NEO-Openness	Values	.29***	.23***
HEXACO-Openness	Creativity	.28***	.22***
HEXACO-Extraversion	Liveliness	.22***	.19***
6FPQ-Openness	Change	.21***	.17***
NEO-Openness	Fantasy	.21***	.16***
6FPQ-Industriousness	Endurance	.19***	.13**
NEO-Extraversion	Activity	.18***	.16***
NEO-Openness	Feelings	.16***	.17***
HEXACO-Extraversion	Social boldness	.15***	.06
6FPQ-Industriousness	Achievement	.15***	.13**
HEXACO-Honesty	Greed-avoidance	.14**	.15***
HEXACO-Conscientiousness	Diligence	.14**	.11**
NEO-Extraversion	Positive emotion	.13**	.13**
NEO-Conscientiousness	Competence	.12**	.06
6FPQ-Independence	Autonomy	.12**	.05
NEO-Agreeableness	Tendermindedness	.09	.16***
HEXACO-Agreeableness	Forgiveness	.09	.13**
6FPQ-Methodicalness	Cognitive structure	-.19***	-.17***
HEXACO-Emotionality	Fearfulness	-.12**	-.09
HEXACO-Emotionality	Anxiety	-.12**	-.02
HEXACO-Conscientiousness	Organization	-.12**	-.07
NEO-Conscientiousness	Dutifulness	-.11**	-.08

*Note.* HEXACO = HEXACO Personality Inventory; 6FPQ = Six Factor Personality Questionnaire; NEO = Revised NEO Personality Inventory. Partial correlations control for age, education, and intelligence. Only correlations significant at or beyond  $p = .01$  are flagged. Values reported are based on a complete subsample of participants,  $n = 493$ . \*\* $p \leq .01$ . \*\*\* $p \leq .001$ .

**Table 4**  
 Domain and Facet Correlations Between the Big Five Inventory (Self- and Informant Report) and Environmental Practices Scale in Study 1

Domain/Facet	Self-Report	Informant Report
Openness	.23***	.23***
Aesthetics	.20***	.25***
Ideas	.20***	.19***
Conscientiousness	-.08	-.06
Order	-.09*	-.08*
Self-discipline	-.04	-.03
Extraversion	.08	.04
Assertiveness	.05	.00
Activity	.13***	.15***
Agreeableness	-.03	.00
Altruism	-.03	.00
Compliance	-.03	.03
Neuroticism	-.01	-.03
Anxiety	-.01	-.03
Depression	.02	-.03

Note. Values based on a complete subsample,  $n = 570$ .

\* $p \leq .05$ . \*\* $p \leq .01$ . \*\*\* $p \leq .001$ .

To further examine these results while controlling for possible shared variance among personality traits, we also regressed EPS scores separately on self-reported and informant-reported BFI scores. As expected, Openness to Experience showed the strongest unique effect on the EPS for both self-report data,  $t = 5.76$ ,  $p < .001$ ,  $\beta = .244$ , and informant data,  $t = 5.96$ ,  $p < .001$ ,  $\beta = .253$ . A smaller, unique effect of Conscientiousness also emerged in the self-report BFI data,  $t = 2.09$ ,  $p = .04$ ,  $\beta = -.09$ . Small negative effects of Extraversion,  $t = 2.10$ ,  $p = .04$ ,  $\beta = -.09$ , and Neuroticism,  $t = 2.19$ ,  $p = .03$ ,  $\beta = -.11$ , also emerged using the informant data. Both self- and informant-reported BFI measures accounted for a small but significant proportion of variance in EPS scores,  $R^2$ s = .07,  $F$ s(5, 564) > 7,  $p$ s < .001. Overall, the EPS-BFI findings appear to provide further evidence that pro-environmental behaviors are most strongly related to the broad domain of Openness to Experience, and specifically to the aesthetics facet of the domain.

## Discussion

Previously reported findings have suggested that environmental attitudes, concern, and behavioral goals are correlated with a number of Big Five personality traits, including Openness to Experience, Agreeableness, Neuroticism, and Conscientiousness (Hirsh, 2010; Hirsh & Dolderman, 2007; Swami et al., 2010). Results from Study 1 revealed a different picture with respect to PEB-personality relations: across four different personality inventories (NEO-PI-R, HEXACO-PI, 6FPQ, BFI), only the broad trait of Openness to Experience correlated strongly and consistently with a simple measure of pro-environmental behaviors (i.e., EPS). Examining this association more carefully at the facet level, we found that individuals who appreciate aesthetic beauty, are creative and inquisitive, and hold a relatively wide breadth of interests tended to self-report participating more frequently in a set of pro-environmental behaviors. That these traits correlate with positive engagement with the environment is perhaps unsurprising, given the firmly established association between appreciation for the natural world (a key component of the aesthetics facet of Openness) and pro-environmental action (cf. Clayton, 2003; Mayer & Frantz, 2004; Nisbet et al., 2009). There also appeared to be a weak but consistent positive correlation between Extraversion and environmental behaviors, although this relation was significantly attenuated once we controlled for shared variance with Openness (cf. John & Srivastava, 2007).<sup>4</sup>

Interestingly, we found no support for our prediction regarding relations between Big Five Agreeableness and pro-environmental behavior, including a lack of association between the EPS and the altruism facets of the BFI and NEO-PI-R. Although it seems reasonable to expect that people who are cooperative, considerate, and compassionate would participate more often in a variety of pro-environmental behaviors (cf. Stern, 2000), this may only be the case to the extent that such behaviors are altruistically motivated,

4. We also examined the interpretability of Extraversion-EPS relations by controlling for overall activity level, which we measured by averaging over participants' responses to all 400 items included in the behavioral inventory described previously. Controlling for this "behavioral activity index," all positive relations between Extraversion and the EPS disappeared; in fact, a small *negative* correlation between 6FPQ-Extraversion and the EPS emerged after controlling for overall activeness.

prosocial acts (Graziano, Habashi, Sheese, & Tobin, 2007). As mentioned above, the EPS does not attempt to cover all domains of environmental behavior; thus, one possible explanation for the observed lack of Agreeableness-EPS relations is that the specific environmental behaviors we asked our respondents about may not have been altruistically motivated ones.

It is interesting to note that while no domain-level relation between Conscientiousness and the EPS was observed, we did find small but significant correlations between various facets of Conscientiousness and environmental action. As hypothesized, some of these relations were positive (i.e., NEO-Competence, HEXACO-Diligence) whereas others (i.e., NEO-Dutifulness, HEXACO-Organization, 6FPQ-Order) were negative. As suggested above, the observed lack of relation at the domain level may have been a result of these conflicting facet-level relations. Moreover, it may be the case that differential relations of various Conscientiousness facets with the EPS reflect opposing secondary loadings of those facets on Openness (e.g., high-Openness facets of Conscientiousness correlate positively with pro-environmental behavior, whereas low-Openness facets correlate negatively). Still, the observed pattern of positive and negative correlations at the facet level in the Conscientiousness domain appears to fit with previous research: performance of environmentally protective behaviors is encouraged and supported both by feelings of self-efficacy (i.e., competence) and of responsibility (cf. Bamberg & Moser, 2007), but likely not by adherence to traditional roles and need for order (e.g., Karp, 1996).

## STUDY 2: COLLEGE SAMPLE

Taken together, the findings presented above support the contention that broadly measured personality traits are related in interesting and potentially enlightening ways to the practice of pro-environmental behaviors. Building on these results, we next explored personality–environmental behavior relations using a different and more diverse measure of environmental practices. In addition, we examined two plausible mediators of personality–behavior relations (i.e., environmental attitudes and connection to nature) in an effort to begin examining the pathways that the association between personality and environmental behavior might take.

## Method

### *Participants*

One hundred fifteen undergraduate students at a large public university in the northwest United States participated in a study of “behavior explanation” for partial class credit. The data presented here were collected as part of a broader study. The sample included 83 females (72%) and had a mean age of 19 years (range: 18–31). Seventy-eight participants (68%) self-identified as “non-environmentalists.”

### *Measures*

Domain- and facet-level personality traits were measured using the Big Five Inventory (BFI); facet-level scores were constructed as suggested by Soto and John (2009). Items were measured using a 5-point scale ranging from 1 (*disagree strongly*) to 5 (*agree strongly*). Environmental attitudes were measured using the 15-item New Ecological Paradigm (NEP; Dunlap et al., 2000; sample item: “Humans are severely abusing the environment”). Affective connection to nature was measured using the 14-item Connectedness to Nature Scale (CNS; Mayer & Frantz, 2004; sample item: “I often feel part of the web of life”). Both measures used a 5-point scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Environmental behaviors were measured using the Student Environmental Behavior Scale (SEBS), a 24-item self-report instrument designed by the first author specifically for use with college students (living on or off campus); it asks participants to indicate how frequently or infrequently they have performed each of 24 behaviors on the following 4-point scale: *never* (1), *sometimes* (2), *often* (3), *always* (4).

### *Procedure*

Students were brought into the lab in groups of three to four, but each participant completed all tasks (including the measures discussed here) while seated at a computer, physically separated from the other participants. The NEP and CNS were measured first, then the environmental behaviors, then demographic variables, and finally the BFI.

## Results

### *Reliabilities and Correlations Among the Measures*

Both the NEP and CNS showed adequate reliability ( $\alpha = .81$  and  $.85$ , respectively). The mean NEP score for the entire sample was 3.71

( $SD = .56$ ) and the mean CNS score was 3.40 ( $SD = .62$ ), showing this sample to be somewhat high in environmental concern. The NEP and CNS were significantly related,  $r(113) = .50, p < .001$ .

Means and standard deviations for the items included in the SEBS are shown in Table 5, along with their correlations with

**Table 5**  
**Mean Scores on the Items in the Student Environmental Behavior Scale in Study 2**

Behavior	Mean	SD	<i>r</i> Total
Warm your car in the morning before driving*	3.57	.75	.24
Leave the lights on when you leave a room*	3.43	.64	.33
Leave the water running while brushing your teeth*	3.38	.90	.35
Throw recyclables (e.g., plastic bottle) in the trash can*	3.36	.84	.34
Recycle paper, plastic, and metal	3.10	.74	.44
Avoid using public transportation*	3.06	.90	.22
Use a reusable water bottle	3.04	.89	.35
Study or work from home	2.92	.79	.10
Consolidate your errands to minimize driving	2.89	.87	.42
Carpool instead of driving your own car	2.70	.82	.40
Bike to school instead of driving	2.67	1.21	.29
Wash your clothes on cold/cold setting	2.63	1.05	.21
Use recycled paper	2.41	.82	.41
Leave your computer on or asleep at night (not fully turned off)*	2.41	1.15	.15
Use reusable shopping bags	2.32	.95	.48
Avoid using paper towels to dry your hands in the bathroom	2.29	.90	.43
Leave electronics plugged in when not in use*	2.17	.86	.17
Talk with friends or strangers about environmental issues	2.09	.81	.52
Print documents single-sided*	2.07	.96	.25
Buy clothing at secondhand stores	1.97	.91	.27
Replace incandescent light bulbs with CFLs	1.95	.99	.36
Take hot showers that are longer than 5 minutes*	1.86	.83	.21
Compost leftover food scraps	1.55	.82	.19
Attend environmental rallies	1.14	.35	.27

*Note.* *r* total reports corrected item versus total-scale correlation. \*Denotes reverse-coded item.  $n = 115$ .

the item-corrected scale. The SEBS activities were not uniformly endorsed, suggesting that the participants did discriminate among behaviors performed more and less frequently. Reliability for the full measure was acceptable ( $\alpha = .76$ ). A principal components analysis revealed that the first component explained 17.5% of the total variance; visual examination of the scree plot suggested that there was a single dominant factor underlying responses to the SEBS. Thus, although the items contained in the SEBS tap multiple facets of environmental behaviors, responses across all 24 behaviors were aggregated into a single environmental behavior score. Participants' mean score on the SEBS was 2.54 ( $SD = .35$ ), and the resulting variable was normally distributed ( $skew = .05$ ;  $kurtosis = .05$ ) with no obvious outliers.

Table 6 shows all zero-order correlations relevant to the present analyses. We found a significant relation between the SEBS and Openness to Experience, as well as correlations of similar magnitude

**Table 6**  
Correlations Between Personality and Environmental Variables  
in Study 2

Domain/Facet	SEBS	NEP	CNS
Openness	.23*	.30**	.45***
Aesthetics	.27**	.27**	.42***
Ideas	.15	.25**	.33***
Conscientiousness	.20*	-.03	.11
Order	.02	-.05	.01
Self-discipline	.25**	-.04	.11
Extraversion	.19*	-.06	.10
Assertiveness	.19*	-.06	.09
Activity	.22*	-.03	.17
Agreeableness	.08	.03	.06
Altruism	.16	.08	.04
Compliance	-.02	.02	.03
Neuroticism	.02	.10	-.14
Anxiety	.04	.01	-.20*
Depression	-.06	.22*	-.03

*Note.* SEBS = Student Environmental Behavior Scale; NEP = New Ecological Paradigm; CNS = Connectedness to Nature Scale.  $n = 115$ .

\* $p \leq .05$ . \*\* $p \leq .01$ . \*\*\* $p \leq .001$ .

with Conscientiousness and Extraversion. As in Study 1, we found no significant correlation of environmental behaviors with Agreeableness (or with Neuroticism). Both the CNS and the NEP were significantly and strongly correlated with the SEBS: CNS,  $r(113) = .52, p < .001$ ; NEP,  $r(113) = .47, p < .001$ . Finally, both measures were significantly correlated with Openness to Experience, but not with any other personality traits.

At the facet level, Study 2's results largely mirrored those of Study 1, with some significant departures. The SEBS measure only correlated significantly with the aesthetics facet of Openness. As in the community sample, we observed a significant positive relation between the activity facet of Extraversion and pro-environmental action. In addition, one other significant facet-SEBS relation uniquely emerged in the student sample, namely, self-discipline.

### *Regression and Mediation Analyses*

We next examined the predictive power of both the personality and environmental attitude/connection measures by regressing participants' scores on the SEBS in a hierarchical multiple regression analysis.<sup>5</sup> Table 7 presents the results of these analyses. In the first step, scores on the SEBS were regressed on the five domain-level trait scores produced by the BFI. Personality explained 11.9% of the variance in the SEBS,  $F(5, 109) = 2.95, p = .02$ ; however, Openness to Experience was the only trait to show a statistically significant unique effect. Neither Extraversion nor Conscientiousness added uniquely to the predictive power of the model, despite their significant zero-order correlations.

Next, participants' mean NEP and mean CNS scores were entered, significantly increasing the predictive power of the model,  $R^2_{change} = .27, F(2, 107) = 24.28, p < .001$ . The final model explained 39% of the variance in students' scores on the SEBS. Both the CNS and NEP were significant predictors of the SEBS, although interpretation of the CNS coefficient is suspect due to multicollinearity with the other predictors in the model (Tolerance = .61). Importantly, the

5. In parallel analyses, we also regressed the CNS and NEP (separately) on the BFI. Together, the five domain-level facets of the BFI explained 22% and 11% of the variance in the CNS and NEP, respectively. However, only Openness to Experience showed a unique effect,  $t = 5.10, p < .001, \beta = .435$  for the CNS, and  $t = 3.32, p < .001, \beta = .302$  for the NEP.

**Table 7**  
 Standardized Regression Coefficients for the Student  
 Environmental Behavior Scale in Study 2

Predictor Variable	Step 1	Step 2
Openness	.222* (.050)	-.029 (.047)
Conscientiousness	.148 (.061)	.134 (.051)
Extraversion	.178 (.041)	.179* (.034)
Agreeableness	.012 (.057)	.008 (.048)
Neuroticism	.126 (.053)	.130 (.045)
CNS		.369*** (.054)
NEP		.297*** (.056)
$R^2$	.119	.391
$R$	.345	.625

*Note.* CNS = Connectedness to Nature Scale; NEP = New Ecological Paradigm. Standard errors shown in parentheses.  $n = 115$ . \* $p \leq .05$ . \*\* $p \leq .01$ . \*\*\* $p \leq .001$ .

unique contributions of the personality predictors changed dramatically: the coefficient for Openness to Experience was no longer different from zero, and Extraversion became a significant predictor.

Based on the results of the regression analysis, we proceeded to conduct more formal mediation analyses. We utilized the Preacher and Hayes (2008) SPSS macro to examine possible mediator effects of the NEP and CNS simultaneously. As suggested by our initial results, the effect of Openness to Experience on environmental behaviors was fully mediated by the NEP (Sobel  $z = 2.35$ ,  $p = .02$ ) and CNS (Sobel  $z = 3.27$ ,  $p = .001$ ). The total effect (c path) for Openness to Experience was .12 ( $p = .01$ ), whereas the direct path (c') was  $-.02$  ( $p = .72$ ). However, the effect of Extraversion did not show any mediation effect through the NEP or CNS (c' path = .07,  $t = 2.29$ ,  $p = .02$ ); this was due to a lack of relation between Extraversion and these measures. There were no other mediated relations between personality traits at the domain level and environmental behavior.

### Discussion

The results of Study 2 were largely consistent with those from Study 1, despite drawing from a different population and the use of a distinct measure of behavior. Using a more diverse measure of environmental practices, we found that individuals who scored highly on Openness to Experience tended to report more pro-environmental behaviors. We also found a positive zero-order correlation between environmental action and Extraversion, replicating our finding from Study 1. We also found a significant positive correlation between our measure of environmental behaviors and Conscientiousness, although in a multiple regression analysis these latter two personality traits provided no unique contribution to prediction.<sup>6</sup> It should be noted that the generalizability of these findings is constrained not only by the use of a college student sample but also by the unequal gender distribution of the sample.

Although zero-order correlations indicated that high scores on our measure of pro-environmental action were related to higher levels of aesthetics, self-discipline, assertiveness, and activity, results of subsequent hierarchical multiple regression and mediation analyses revealed a somewhat different picture of the unique relations between personality traits and environmental behaviors. Also, even though the broad personality factors did predict a significant amount of variance in the Student Environmental Behavior Scale, their unique and total predictive power was small relative to the effect of environmental attitudes (as measured by the NEP) and connection to nature (as measured by the CNS). These results suggest a modest and distal role of personality in shaping individuals' PEB, though it should be noted that stronger effects of personality may have been observed had we used other measures of personality.

The full mediation of the Openness-behavior relation through the NEP and CNS further supports the conclusion that personality is a relatively distal predictor of environmental behaviors. At the same time, we also found evidence of a direct, if weak, path (at least, one that does not travel through environmental attitudes/connection)

6. We also explored the relation between the self-discipline facet of Conscientiousness and environmental behavior; secondary analyses not presented here consistently revealed that neither the domain-level nor facet-level measures of Conscientiousness contributed uniquely to the prediction of students' scores on the SEBS measure after controlling for other personality traits.

from personality (i.e., Extraversion) to pro-environmental behaviors. Although such a direct path is plausible, further research is necessary to confirm this finding and to explore other possible mediators. The lack of relation between Extraversion and both the NEP and CNS provides further evidence that the observed link may be due to a tendency for extraverts to simply be more active in general (see note 4).

### GENERAL DISCUSSION

The present research examined the relations of broad personality factors and their subfacets with the performance of pro-environmental behaviors (PEBs). Across two distinct samples, a wide variety of personality inventories, and two measures of PEB, we found a consistent, moderate, positive association between the broad trait of Openness to Experience (and its facets) and pro-environmental action. Results from both studies suggest that this relation is driven primarily by the facet of aesthetic appreciation and to a lesser extent by the intellectualism/inquisitiveness aspect of Openness. Moreover, Study 2 results indicated that individuals' environmental attitudes and connection to nature likely mediate this relation. Study 1 demonstrated the robustness of these findings by showing highly consistent effect sizes across four distinct personality inventories; it should also be noted that this consistency was found despite the relatively low reliability of the behavioral measure used in Study 1, which may have attenuated the size of the correlations. Study 2 replicated the Openness finding using one overlapping personality inventory (BFI) and a distinct and more diverse measure of PEB. In addition, regression analyses across both studies revealed that Openness was the only domain-level trait to consistently demonstrate unique predictive validity.

Perhaps most surprisingly, personality traits associated with wanting to "do the right thing" and being well socialized (e.g., Agreeableness, Conscientiousness) were inconsistently related to the performance of pro-environmental behaviors. While we did find that certain aspects of Conscientiousness, namely, self-discipline and competence, tended to correlate positively (but weakly) with behavior, others, including preferences for order and organization, correlated negatively. As alluded to above, these contradictory

facet-level relations may have essentially canceled each other out, resulting in the null findings at the domain level. However, the same argument cannot be made for Agreeableness, for which neither domain-level measures nor facet-level components (e.g., altruism, compliance, patience) showed consistent positive relations to environmental behavior.

Given past research linking personality, prosociality, and nonbehavioral environmentalism (cf. Hirsh & Dolderman, 2007), as well as the more established link between Agreeableness and helping behavior (Graziano & Habashi, 2010), how do we explain the apparent disconnect observed here between pro-environmental behaviors and other prosocial and communal aspects of one's personality dispositions? One possibility, suggested above, is that the specific behavioral items contained in our measures of pro-environmental behavior did not tap the "prosocial facet" of the environmental domain. However, this seems unlikely given our use of a much longer and more diverse measure of PEB in Study 2. Another plausible possibility is that, at least within the two American populations sampled, altruism may have had relatively little to do with the performance of pro-environmental behavior; indeed, our results seem to suggest that the distinguishing personality-level features of the (northwestern U.S.) pro-environmental individual are relatively high levels of aesthetic appreciation, creativity, inquisitiveness, and a willingness to try new things. Moreover, these results appear to be in line with related and recent work examining the relations among system-justifying tendencies, political ideology, and environmental behavior (Feygina et al., 2010).

In addition to improving our understanding of current PEIs, our findings may also hold important implications for the design of environmental behavior intervention programs and campaigns. For example, to the extent that Openness-related motives drive adoption of new PEBs, interventions should focus on making PEBs seem new, exciting, cutting-edge, and of great importance; of course, framing PEB in these terms would likely not appeal to low-Openness individuals who prefer to follow and maintain the status quo (e.g., American conservatives). More generally, our findings suggest that practitioners and others charged with intervention design would do well to consider the stable psychological characteristics (e.g., personality traits) of their target audiences when creating messaging and other materials. Moreover, given known group-level differences in

the relative incidence of different broad personality traits (see Rentfrow, Gosling, & Potter, 2008), it will likely be useful for practitioners and researchers to identify target group-specific personality profiles as part of initial intervention design processes.

### **Explaining Differences Between Present and Past Findings**

Although discussed to some extent above, it seems prudent to briefly revisit the issue of apparent divergence between the findings reported here and past research on personality correlates of environmentalism (e.g., Hirsh, 2010; Hirsh & Dolderman, 2007; Swami et al., 2010; Wiseman & Bogner, 2003). As far as we are aware, past research on domain-level personality traits and the environment has only examined nonbehavioral aspects of environmentalism (e.g., environmental concern, connection to nature, behavioral goals). The present research explicitly set out to examine broad personality trait correlates of previously performed environmental *behaviors*. Thus, our “failure” to replicate exactly the relations between personality and environmentalism reported by the authors cited above may simply reflect very real differences in how personality relates to nonbehavioral aspects of environmentalism as opposed to behavioral ones. Moreover, our findings are in fact closely in line with PEB research on narrower personality traits (e.g., social dominance orientation, system justifying). Finally, as alluded to above, culture may moderate the relations of broad personality traits to environmentalism (conceptualized behaviorally or otherwise), and our use of American samples for the first time (as opposed to Canadian or European ones) may partially account for the apparent differences between the present findings and past research.

### **Limitations and Future Directions**

The present research is limited in a number of ways. As mentioned above, one obvious methodological limitation is the reliance on self-reports of PEBs. Although there is now considerable evidence supporting the use of self-reported environmental behavior measures (e.g., Kaiser, Frick, & Stoll-Kleemann, 2001), future research should attempt to measure behaviors using alternative methods, including peer-report and direct observation. In a related vein, we used two measures of PEB that were developed for use in these particular studies, and neither measure has been thoroughly tested for

reliability and validity. Moreover, neither measure of PEB fully captured the wide range of behaviors that can be considered pro-environmental; thus, conclusions about the relation of personality to PEB must be made cautiously based on the present results. However, the overwhelming similarities between the findings of Studies 1 and 2, which used very different measures of environmental behaviors, suggest that both the EPS and SEBS were adequate, if not ideal, measures of PEB. It should also be noted that the measurement of environmental attitudes and connection to nature prior to asking participants about their pro-environmental actions may have led to inflated reports of positive PEB in Study 2; however, while the introduction of the NEP and CNS prior to the SEBS could, plausibly, have increased the PEB scores of those with strong environmental attitudes/connection to nature, this should not have had any biasing effect on the behavior-personality relations, which were of primary interest.

It is also important to note limitations of both samples used in the present research. Study 2 overrepresented women, possibly skewing results (if the relation between personality and PEB differs significantly between the sexes). Perhaps more importantly, while the samples used in Studies 1 and 2 differed significantly in most ways (e.g., data collected more than 10 years apart, community vs. student sample), they were both collected in the same region of the United States, namely Oregon. Rentfrow et al. (2008) have found that Oregonians are, relative to the rest of the United States, high in Openness to Experience. Given the consistent relation of Openness with PEB, as well as the divergence of the present findings from work conducted in other cultures (see above), it seems important to establish whether the present findings are seriously affected by cultural contexts and regional differences in both personality and potential for positive engagement with the environment; for example, “structural” barriers to PEB are relatively low for most Oregonians, which may increase the relative importance of personality, attitudes, and other psychological factors on PEB (cf. Guagnano, Stern, & Dietz, 1995).

### Conclusions

In examining how the most stable and core characteristics of individuals relate to the performance of pro-environmental behavior, the present research provides a fresh perspective on the critical issue of what motivates pro-environmental practices. We found that

pro-environmental individuals in our samples were relatively high in Openness to Experience but that they did not differ from others with respect to altruism-related personality traits. While the importance of a personality perspective on PEB should not be overstated (given the modest size of the correlations reported above), our findings may hold important implications for both the study and future encouragement of PEB. In expanding the scope of research beyond (but also including) traditionally studied correlates of PEB, we have added to the growing body of research that is beginning to paint a more complete, and nuanced, portrait of the pro-environmental individual.

## REFERENCES

- Allen, R. S., Castano, E., & Allen, P. D. (2007). Conservatism and concern for the environment. *Quarterly Journal of Ideology*, *30*, 1–25.
- Ashton, M. C., & Lee, K. (2007). Empirical, theoretical, and practical advantages of the HEXACO model of personality structure. *Personality and Social Psychology Review*, *11*, 150–166.
- Bamberg, S., & Moser, G. (2007). Twenty years after Hines, Hungerford and Tomera: A new meta-analysis of psycho-social determinants of pro-environmental behaviour. *Journal of Environmental Psychology*, *27*, 14–25.
- Cameron, L. D., Brown, P. M., & Chapman, J. (1998). Social value orientations and decisions to take proenvironmental action. *Journal of Applied Social Psychology*, *28*, 675–697.
- Cialdini, R. B., Reno, R. R., & Kallgren, C. A. (1990). A focus theory of normative conduct: Recycling the concept of norms to reduce littering in public places. *Journal of Personality and Social Psychology*, *58*, 1015–1026.
- Clayton, S. (2003). Environmental identity: A conceptual and an operational definition. In S. Clayton & S. Opatow (Eds.), *Identity and the natural environment* (pp. 45–65). Cambridge, MA: MIT Press.
- Costa, P. T., & McCrae, R. R. (1992). *NEO PI-R professional manual*. Odessa, FL: Psychological Assessment Resources.
- Davidson, D. J., & Freudenburg, W. R. (1996). Gender and environmental risk concerns: A review and analysis of available research. *Environment and Behavior*, *28*, 302–339.
- Dietz, T., Fitzgerald, A., & Shwom, R. (2005). Environmental values. *Annual Review of Environmental Resources*, *30*, 335–372.
- Dunlap, R. E., Van Liere, K. D., Mertig, A. G., & Jones, R. E. (2000). Measuring endorsement of the New Ecological Paradigm: A revised NEP scale. *Journal of Social Issues*, *56*, 425–442.
- Feygina, I., Jost, J. T., & Goldsmith, R. E. (2010). System justification, the denial of global warming, and the possibility of “system-sanctioned change.” *Personality and Social Psychology Bulletin*, *36*, 326–338.

- Frick, J., Kaiser, F. G., & Wilson, M. (2004). Environmental knowledge and conservation behavior: Exploring prevalence and structure in a representative sample. *Personality and Individual Differences*, *37*, 1597–1613.
- Funder, D. C. (2007). *The personality puzzle*. New York: Norton.
- Garling, T., Fujii, S., Garling, A., & Jakobsson, C. (2003). Moderating effects of social value orientation on determinants of pro-environmental behavior intention. *Journal of Environmental Psychology*, *23*, 1–9.
- Goldberg, L. R. (1993). The structure of personality traits: Vertical and horizontal aspects. In D. C. Funder, R. D. Parke, C. Tomlinson-Keasey, & K. Widaman (Eds.), *Studying lives through time: Personality and development* (pp. 169–188). Washington, DC: American Psychological Association.
- Goldberg, L. R. (1999). A broad-bandwidth, public-domain, personality inventory measuring the lower-level facets of several five-factor models. In I. Mervielde, I. Deary, F. De Fruyt, & F. Ostendorf (Eds.), *Personality psychology in Europe* (Vol. 7, pp. 7–28). Tilburg, The Netherlands: Tilburg University Press.
- Goldstein, N. J., Griskevicius, V., & Cialdini, R. B. (2007). Invoking social norms: A social psychology perspective on improving hotels' linen-reuse programs. *Cornell Hospitality Quarterly*, *48*, 145–150.
- Gosling, S. D., Rentfrow, P. J., & Swann, W. B., Jr. (2003). A very brief measure of the Big-Five personality domains. *Journal of Research in Personality*, *37*, 504–528.
- Graziano, W. G., & Habashi, M. H. (2010). Motivational processes underlying both prejudice and helping. *Personality and Social Psychology Review*, *14*, 313–331.
- Graziano, W. G., Habashi, M. H., Sheese, B. E., & Tobin, R. M. (2007). Agreeableness, empathy, and helping: A person  $\times$  situation perspective. *Journal of Personality and Social Psychology*, *93*, 583–599.
- Guagnano, G. A., Stern, P. C., & Dietz, T. (1995). Influences on attitude-behavior relationships: A natural experiment with curbside recycling. *Environment and Behavior*, *27*, 699–718.
- Hartig, T., Kaiser, F. G., & Bowler, P. A. (2001). Psychological restoration in nature as a positive motivation for ecological behavior. *Environment and Behavior*, *33*, 590–607.
- Hines, J. M., Hungerford, H. R., & Tomera, A. N. (1986/87). Analysis and synthesis of research on responsible environmental behavior: A meta-analysis. *Journal of Environmental Education*, *18*, 1–8.
- Hirsh, J. B. (2010). Personality and environmental concern. *Journal of Environmental Psychology*, *30*, 245–248.
- Hirsh, J. B., & Dolderman, D. (2007). Personality predictors of consumerism and environmentalism: A preliminary study. *Personality and Individual Differences*, *43*, 1583–1593.
- Jackson, D. N., Paunonen, S. V., & Tremblay, P. F. (2000). *Six Factor Personality Questionnaire*. Port Huron, MI: Sigma Assessment Systems.
- John, O. P., Donahue, E. M., & Kentle, R. L. (1991). *The Big Five Inventory—Versions 4a and 54*. Berkeley: University of California, Berkeley, Institute of Personality and Social Research.

- John, O. P., & Srivastava, S. (1999). The Big-Five trait taxonomy: History, measurement, and theoretical perspectives. In L. Pervin & O. P. John (Eds.), *Handbook of personality: Theory and research* (2nd ed., pp. 102–138). New York: Guilford Press.
- Jost, J. T., Glaser, J., Kruglanski, A. W., & Sulloway, F. J. (2003). Political conservatism as motivated social cognition. *Psychological Bulletin*, **129**, 339–375.
- Kaiser, F. G. (1998). A general measure of ecological behavior. *Journal of Applied Social Psychology*, **28**, 395–422.
- Kaiser, F. G., Frick, J., & Stoll-Kleemann, S. (2001). Accuracy of self-reports: Validating the General Ecological Behavior Scale. *Diagnostica*, **47**, 88–95.
- Kalof, L., Dietz, T., Guagnano, G. A., & Stern, P. C. (2002). Race, gender and environmentalism: The atypical values and beliefs of white men. *Race, Gender & Class*, **9**, 1–19.
- Karp, D. G. (1996). Values and their effects on pro-environmental behavior. *Environment and Behavior*, **28**, 111–133.
- Kollmuss, A., & Agyeman, J. (2002). Mind the gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research*, **8**, 239–260.
- Lee, K., & Ashton, M. C. (2004). Psychometric properties of the HEXACO Personality Inventory. *Multivariate Behavioral Research*, **39**, 329–358.
- Loehlin, J. C., & Nichols, R. C. (1976). *Heredity, environment, and personality: A study of 850 sets of twins*. Austin: University of Texas Press.
- Mayer, F. S., & Frantz, C. M. (2004). The Connectedness to Nature Scale: A measure of individuals' feeling in community with nature. *Journal of Environmental Psychology*, **24**, 503–515.
- McKenzie-Mohr, D., & Smith, W. (1999). *Fostering sustainable behavior. An introduction to community-based social marketing*. Gabriola Island, British Columbia: New Society.
- Nisbet, E. K., Zelenski, J. M., & Murphy, S. A. (2009). The Nature Relatedness Scale: Linking individuals' connection with nature to environmental concern and behavior. *Environment and Behavior*, **41**, 715–740.
- Nolan, J., Schultz, P. W., Cialdini, R. B., Goldstein, N. J., & Griskevicius, V. (2008). Normative social influence is underdetected. *Personality and Social Psychology Bulletin*, **34**, 913–923.
- Oom Do Valle, P., Rebelo, E., Reis, E., & Menezes, J. (2005). Combining behavioral theories to predict recycling involvement. *Environment and Behavior*, **37**, 364–396.
- Pratto, F., Sidanius, J., Stallworth, L. M., & Malle, B. (1994). Social dominance orientation: A personality variable predicting social and political attitudes. *Journal of Personality and Social Psychology*, **67**, 741–763.
- Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, **40**, 879–891.
- Rentfrow, P. J., Gosling, S. D., & Potter, J. (2008). A theory of the emergence, persistence, and expression of geographic variation in psychological characteristics. *Perspectives on Psychological Science*, **3**, 339–369.

- Schultz, P. W. (2001). The structure of environmental concern: Concern for self, other people, and the biosphere. *Journal of Environmental Psychology*, **21**, 327–339.
- Soto, C. J., & John, O. P. (2009). Ten facet scales for the Big Five Inventory: Convergence with NEO-PI-R facets, self-peer agreement, and discriminant validity. *Journal of Research in Personality*, **43**, 84–90.
- Stern, P. C. (2000). Toward a coherent theory of environmentally significant behavior. *Journal of Social Issues*, **56**, 407–424.
- Stern, P. C., Dietz, T., Abel, T., Guagnano, G. A., & Kalof, L. (1999). A value-belief-norm theory of support for social movements: The case of environmental concern. *Human Ecology Review*, **6**, 81–97.
- Stern, P. C., Dietz, T., Kalof, L., & Guagnano, G. A. (1995). Values, beliefs, and proenvironmental action: Attitude formation toward emergent attitude objects. *Journal of Applied Social Psychology*, **25**, 1611–1636.
- Swami, V., Chamorro-Premuzic, T., Snelgar, R., & Furnham, A. (2010). Egoistic, altruistic, and biospheric environmental concerns: A path analytic investigation of their determinants. *Scandinavian Journal of Psychology*, **51**, 139–145.
- Thøgersen, J., & Olander, F. (2006). To what degree are environmentally beneficial choices reflective of a general conservation stance? *Environment and Behavior*, **38**, 550–569.
- Wiseman, M., & Bogner, F. X. (2003). A higher-order model of ecological values and its relationship to personality. *Personality and Individual Differences*, **34**, 783–794.
- Zelezny, L. C., Chua, P. P., & Aldrich, C. (2000). Elaborating on gender differences in environmentalism. *Journal of Social Issues*, **56**, 443–457.