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RESEARCH ARTICLE

Environmental Attitudes Outweigh Personality in Predicting Pro-Environmental Behaviour: An Investigation of the Dark and Light Triads

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ABSTRACT

Identifying predictors of pro-environmental behaviour (PEB) is critical for designing effective interventions to reduce environmentally harmful activities. This study examined whether personality traits, specifically the Dark Triad (Machiavellianism, narcissism, psychopathy) and Light Triad (Kantianism, humanism, faith in humanity), and environmental attitudes, predicted PEB. Australian participants (N = 383) completed an online survey assessing these personality traits, environmental attitudes, and two measures of PEB: dietary behaviour (meat consumption) and willingness to donate to an environmental charity. Analyses using hierarchical regressions and MANOVAs indicated that only narcissism and psychopathy modestly reduced donation likelihood and Kantianism modestly increased it; however, there was limited evidence of mediation by environmental attitudes between personality traits and PEB. In contrast, stronger environmental activism and lower human dominance attitudes robustly predicted both lower meat consumption and greater donation likelihood. These findings suggest that although personality shapes environmental attitudes, the attitudes themselves play a more direct role in driving PEB. Overall, the results support attitude-behaviour models and highlight attitudinal change as a pathway for designing effective sustainability interventions.

Keywords: Pro-environmental behaviour; environmental attitudes; Dark Triad; Light Triad; personality

1. Introduction

Climate change has been widely acknowledged as one of the most pressing challenges facing humanity, with consequences ranging from ecological degradation to human health impacts[1]. A significant contributor to environmental degradation is human behaviour, including excessive consumption and waste generation, reliance on fossil fuels, and unsustainable dietary practices[2,3]. As such, behavioural change at the individual and collective levels has become a central objective in climate change mitigation strategies[4]. However, not all individuals engage equally in pro-environmental behaviour (PEB), raising questions about which individual differences facilitate, or hinder, these behaviours.

1.1. Pro-environmental behaviours

PEB encompass a broad range of voluntary actions intentionally performed to benefit the environment

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or to minimise one's negative impact on the environment[3,5]. These behaviours may include recycling, reducing energy consumption, avoiding single-use plastics, environmental activism, donating to environmental causes, and altering dietary choices - particularly by reducing meat intake[6,7]. Participating in PEB typically involves personal costs, while the potential benefits are often uncertain, distal, and hinge upon collective action[8]. Plant-based diets, such as veganism, are associated with reduced environmental impacts compared to omnivorous or carnivorous diets[9]. Conversely, diets high in animal products contribute substantially to greenhouse gas emissions, deforestation, and biodiversity loss[7]. As such, altering one's dietary behaviour to a predominately or fully plant-based diet can be classified as a form of PEB. Those who hold concern for the welfare of animals and the environment are more likely to engage in plant-based diets and environmental activist behaviours[10]. Conversely, those who engage in predominately meat-based diets typically express less concern for animal welfare and for the environmental impacts of their diet than those on plant-based diets[11,12]. While structural factors (e.g., policy, infrastructure) and other contextual and individual factors (e.g., religion, social norms, morals[4,13-15]) influence adoption of these types of PEB behaviours, psychological determinants also play a critical role in facilitating or hindering their adoption[16]. Among these psychological determinants, two explanations dominate as potential predictors of PEB: environmental attitudes and morally-valanced personality traits.

1.2. Pro-environmental attitudes

Pro-environmental attitudes reflect consistent concern for environmental issues across contexts and are measured by beliefs about ecological balance, animal welfare, and environmental activism[17,18]. These attitudes influence a range of behavioural intentions and have subsequently been associated with increased PEB[17,19-22], consistent with the theory of planned behaviour[23]. For instance, individuals who viewed humans as stewards of the earth and who expressed concern about biodiversity loss were more likely to engage in sustainable behaviours[24]. Hayley et al.[25] found strong negative associations between attitudes toward reducing meat consumption and actual consumption of meat. Further, greater environmental concern is associated with an increased likelihood of donating to an environmental charity[26].

Yet, the predictive power of environmental attitudes is tempered by the "attitude-behaviour gap"[17,27,28], which highlights inconsistencies between expressed environmental concern and actual PEB. For instance, whilst most people understand the environmental and ethical impacts of their meat consumption, they often provide justifications (e.g. tradition, convenience) for their meat-eating behaviour. This is a way of coping with the ethical and moral dilemmas of contrasting beliefs about animal welfare and environmental wellbeing, and their actual behaviour[29]. This attitude-behaviour gap underscores the complexity of environmental decision-making and the potential influence of other psychological variables. Thus, while pro-environmental attitudes are widely recognised as influential predictors of PEB, they do not fully account for individual differences observed in actual environmental practices. Thus, examining psychological traits, such as personality, may provide further insights.

In the context of the present study, environmental attitudes represent more immediate, situationally activated cognitions, whereas personality traits are likely more distal and abstract. Dual-process models of decision-making suggest that environmentally relevant decisions often rely on quick affective responses rather than trait-based dispositions[16,30]. This theoretical distinction helps explain why attitudes may outperform personality traits as predictors of PEB. Furthermore, because environmental attitudes are socially desirable in many contexts[31], they may be more readily activated in self-report and behavioural contexts, amplifying their influence relative to more stable and less context-sensitive personality traits.

1.3. The dark and light triads

Personality offers a complementary lens for understanding individual differences in PEB. Personality traits are relatively stable psychological characteristics that influence how individuals perceive, interpret, and respond to their environment[32].

The Dark Triad, comprising Machiavellianism, narcissism, and psychopathy, describes socially aversive personality traits[33]. Broadly, the Dark Triad has been found to be characterised by disagreeableness, self-interest, antisocial behaviour, and exploitative and self-serving attitudes[34-37]. Machiavellianism involves deceit, strategic manipulation, pursuit of power, and prioritising personal gain over greater good[38]. Psychopathy is characterised by impulsivity, antisocial behaviour, callousness, and lack of empathy[34]. Narcissism reflects grandiosity, a sense of entitlement, fantasies of power, and diminished empathy[34,39,40]. Individuals high in these traits tend to disregard ethical considerations and may be less inclined to consider the long-term consequences of their actions on others due to a focus on self-importance and self-gratification[33,41], which may include a lack of consideration of their environmental impacts.

In contrast, the Light Triad, which is made up of Kantianism (treating others as ends in themselves[35], humanism (valuing the dignity of others[42]), and faith in humanity (believing in the goodness of people[40]), represents prosocial orientations associated with integrity and cooperation[35]. These traits are theoretically and empirically aligned with greater empathy[35], and sustainable behaviours[43,44]. Kantianism, in particular, appears to buffer against antisocial behaviour[45,46].

Although not entirely consistent, studies generally show a positive relationship between the Light Triad with pro-environmental attitudes and PEB, and a negative relationship between the Dark Triad and these outcomes[40,44,47-49].

Focusing specifically on diet-related PEB, individuals who engage in no/low meat diets report lower levels of Dark Triad compared with those who consume moderate/high levels of meat[50]. Further supporting this trend, Kesenheimer and Greitemeyer's[44] diary study highlighted a positive predictive relationship between pro-environmental attitudes and PEB, and Light Triad. Conversely, Dark Triad traits negatively predicted pro-environmental attitudes and frequency of PEB (PEB was self-reported daily engagement in a range of activities including nutritional choices, transport, recycling, and waste disposal). The relationship between the Triads and the prediction of PEB held when accounting for environmental attitudes. Similarly, Uçar et al.[49] reported the Dark Triad to be associated with lower pro-environmental values (biospheric value and altruism) and PEB (measured by retrospective self-reports of PEB and behavioural intentions), whereas Light Triad demonstrated positive associations. Moreover, biospheric values mediated the relationship between both Triads and past PEB. However, unlike Kesenheimer & Greitemeyer[44], Uçar et al.[49] did not find robust direct predictive relationships between personality and PEB, such that when broader values were considered the direct effects disappeared.

Machiavellianism and psychopathy, in particular, have been frequently identified as negatively associated with pro-environmental attitudes[51,52] and self-reported PEB[40,48,50]. Individuals high in Machiavellianism may be more likely to justify environmentally harmful behaviours, such as meat consumption, for their own self-interest, prioritising personal gain over sustainability[40]. Similarly, those high in psychopathy demonstrate greater impulsive behaviour, favouring immediate rewards[53], which may reduce likelihood of making long-term sustainable choices.

However, the relationship between narcissism and environmentalism remains complex and context dependent. Although, theoretically, narcissism could promote unsustainable resource consumption based upon beliefs of self-importance, empirical evidence suggests the relationship between environmentalism and

narcissism may depend on reputational motives. Indeed, narcissists may actually exhibit greater environmentalism under certain circumstances where being seen to protect the environment is likely to enhance their public image[54-56].

Given that personality traits are more distal predictors of behaviour, it is plausible that their influence on PEB is mediated by environmental attitudes. For example, those high in Machiavellianism may be more likely to endorse anthropocentric worldviews, which in turn may reduce their likelihood of engaging in PEB. Similarly, individuals high in faith in humanity may express stronger concern for future generations, thereby enhancing their commitment to sustainable living. Research has shown environmental attitudes to significantly mediate the relationship between HEXACO personality traits and PEB[57]. However, the role of environmental attitudes in mediating the relationship between Dark/Light Triad and PEB is not yet understood. The present study extends this literature by examining Dark and Light Triads within a single predictive framework, an approach rarely taken in previous studies. This allows clearer assessment of how these traits exert unique or overlapping influences on environmental attitudes and behaviour. Further, positioning personality as a distal predictor in the trait-attitude-behaviour model, may help to clarify why direct effects of the Triads are often inconsistently reported in the literature.

1.4. Gender considerations

Research has indicated that women typically exhibit greater environmental and animal welfare concerns, and more frequent engagement in plant-based diets and other PEBs compared to men[40,48,58-60]. Men have also been found to employ more direct strategies to justify high meat consumption, such as denying animal suffering, viewing humans as inherently better than animals, and asserting that it is natural to consume animals[61]. These differences may be, in part, due to higher Dark Triad trait levels typically found among men compared to women[48,62]. Indeed, men report higher scores on the Dark Triad traits, particularly psychopathy, higher meat-eating justification strategies, and greater meat consumption[48]. This suggests that gender may be linked, inherently or socially, with personality, attitudes, and subsequent behaviours in this domain.

1.5. The present study

Building on previous research[40,44,48-50], this study investigated the predictive utility of individual Dark and Light Triad traits on pro-environmental attitudes and PEB. Most of the previous work has not simultaneously looked at both the Dark and Light aspects of personality within a single model e.g., only looked at Dark Triad[40,48,50], or aggregated scores across Triad dimensions rather than assessing their individual influence[44,49].

Second, to measure PEB, the current study employs both diet behaviour and a decision regarding an environmental charity donation. Thus, this study directly answers calls[44,49,51,55,63] to move beyond exclusive self-report or recall measures of PEB or reporting only behavioural intentions, to a more objective measure of actual behaviour. Our results will be able to ascertain whether the same psychological drivers operate across meat consumption restriction (diet) and pro-social contribution (donation), which previous single-domain studies could not test. By including an objective, reputation-neutral donation decision, the design also tests whether narcissistic "green self-presentation", potentially influencing greater PEB, holds in contexts when image-boosting is unlikely, assessing narcissism's conditional PEB links.

Third, the current study also seeks to assess environmental attitudes as a mediator between personality and behaviour to elucidate the reasons for the attitude-behaviour gap, clarifying causal pathways. Two specific aspects of environmental attitudes were considered, drawn from the Environmental Attitudes Inventory[64]. Human dominance reflects the belief that humans are separate from, and masters of, the

environment. This is an anti-environmental attitude and theoretically would be associated with higher levels of Dark Triad traits due to preoccupation with control and exploitation, and lower PEB. Environmental activism reflects support for pro-environmental actions. Theoretically, this would be associated with higher levels of Light Triad traits, due to the concern for both present and future generations, and higher PEBs. Finally, the study adds geographic diversity (i.e., an Australian sample) to a literature dominated by European samples.

In sum, this study responds directly to methodological critiques (over-reliance on self-reports of PEB), conceptual omissions (lack of both Dark and Light modelling), and theoretical uncertainty (unverified attitudinal mediation). Importantly, the present study advances theoretical understanding by integrating traits, attitudes, and behavioural outcomes within a unified predictive model. Whereas prior research has largely examined these components in isolation, our approach allows assessment of whether personality exerts unique effects beyond attitudes, or whether attitudes function as the more proximal and dominant predictor of PEB. Understanding these relationships may enhance targeted environmental interventions and educational campaigns aiming to increase PEB or reduce anti-environmental behaviours, including high levels of meat consumption.

This study specifically aims to: investigate whether Dark and Light Triad traits individually predict environmental attitudes and behaviours and examine whether environmental attitudes mediate the relationship between personality traits and PEB. Based upon previous research[44,49,50] finding Dark and Light Triads to be predictive of environmental attitudes and behaviours, we expect that Dark Triad traits will positively predict human dominance attitudes to the environment (H1a), and negatively predict environmental activism attitudes (H1b) and pro-environmental behaviours (H1c); and Light Triad traits will negatively predict human dominance attitudes (H2a), and positively predict environmental activism attitudes (H2b) and pro-environmental behaviours (H2c). Based upon previous research suggesting a relationship between environmental attitudes and PEB[19-25], we expect that PEB will be positively predicted by environmental activism attitudes (H3) and negatively predicted by human dominance attitudes (H4); and that the two environmental attitudes will mediate the relationship between Dark (H5a) and Light Triad (H5b) and PEB. Given that research has found gender differences in environmental attitudes, PEB, and Dark Triad[40,58] analyses will control for gender.

2. Materials and methods

2.1. Participants

Participants were 383 Australian residents (74.4% women, 22.2% men, 3.4% gender diverse) ranging in age from 18 to 75 years (M = 27.22, SD = 12.11). See Table 1 for participant demographic information. Recruitment was conducted through multiple channels to ensure a heterogeneous sample representing the extremes (no/low – high) of meat-eating consumption, including targeted Facebook groups (e.g., vegan, vegetarian, and carnivore diet communities), local community localities, such as grocery stores, and via a Western Australian University's student research participation platform. Participants recruited via the university system received course credit, while both student and community participants were incentivised through the option of entering a prize draw.

Responses were excluded if participants did not reside in Australia or were under 18 years of age or did not complete the majority of the survey. Of the 612 individuals who began the survey, 383 (63%) provided complete/near complete data and met all inclusion criteria. The final sample included a mix of students (~48%) and community members (~52%), with the student cohort younger on average (M = 22.29, SD =

5.63) than the community sample (M = 31.82, SD = 14.48). Most of the sample identified as omnivore (71%) and approximately 17% identified in a category restricting the consumption of animal products[1].

Table 1. Sociodemographic characteristics of participants

Sociodemographic characteristic	*n*	%	*M*	*SD*
Age			27.22	12.11
Gender				
Woman	285	74.4		
Man	85	22.2		
Gender Diverse	13	3.4		
Education level (achieved or studying)				
High School or less	126	32.9		
Certificate or Diploma/Advanced Diploma	75	19.6		
Bachelors	148	38.6		
Postgraduate	33	8.6		
Other – Unspecified	1	0.3		
Dietary Identity				
Omnivore	275	71.8		
Carnivore	42	11.0		
Low/no meat	64	16.6		
Vegan	*22*	*5.7*		
Vegetarian	*17*	*4.4*		
Flexitarian	*20*	*5.2*		
Pescatarian	*5*	*1.3*		
Other	3	0.8		

Note. *Other dietary Identity 'other' category includes ketovore, pollotarian, and unspecified.*

2.2. Measures

2.2.1. Demographics

Participants self-reported their age, gender, education level, and dietary identity. Gender options were: woman, man, non-binary, prefer not to say, and self-description. As gender was used only as a control variable, only those identifying as men or women were included.

2.2.2. Personality

The Dark Triad. The Short Dark Triad scale[62] (SD3) is a 27-item scale comprising three subscales, each with nine items: *Machiavellianism* (e.g., "It's not wise to tell your secrets"), narcissism (e.g., "People see me as a natural leader"), and *psychopathy* (e.g., "I like to get revenge on authorities"). Items were rated on a 5-point Likert scale (1 = *strongly disagree*, 5 = *strongly agree*). Internal consistency was acceptable for all subscales: α = .75 (*Machiavellianism*), α = .71 (*narcissism*), α = .72 (*psychopathy*).

[1] This is greater than the approximately 10% of Australians who report that their diet restricts animal products[63], but this discrepancy is expected given our targeted recruitment around the extremes of no-high meat consumption.

The Light Triad. The Light Triad Scale[66] is a 12-item scale comprising three subscales, each with four items: *Kantianism* (e.g., "When I talk to people, I am rarely thinking about what I want from them"), *humanism* (e.g., "I tend to admire others"), and *faith in humanity* (e.g., "I think people are mostly good"). Participants expressed their agreement with each statement on a 5-point Likert-type scale (1 = *strongly disagree*, 5 = *strongly agree*). Reliability was acceptable for two sub-scales: *humanism* (α = .74), *faith in humanity* (α = .73), but only meeting minimal adequacy for *Kantianism* (α = .66). Given the borderline reliability of the Kantianism subscale, interpretive caution is warranted and noted in the limitations.

2.2.3. Environmental attitudes

Two, six-item, subscales from the Environmental Attitudes Inventory[64] were employed: *environmental activism* (e.g., "I would like to support an environmental organisation") assessed willingness to engage in activism, while *human dominance* (e.g., "Plants and animals exist primarily to be used by humans") measured anthropocentric worldviews, with the former being a pro-environmental attitude and the latter an anti-environmental attitude. Items were rated on a 5-point scale (1 = *strongly disagree*, 5 = *strongly agree*). Two reverse-coded items ("Humans are no more important than any other species" and "Plants and animals have as much right as humans to exist") were removed from the human dominance subscale after not loading strongly within factor analysis and reliability testing. After item deletion, both subscales showed good reliability: α = .89 (*activism*), α = .88 (*dominance*), higher than reported by Sutton & Gyuris[64].

2.2.4. Pro-environmental behaviour

PEB was measured by participants' self-report dietary identity (see Table 1) and willingness to donate to an environmental charity.

Dietary behaviour. Dietary behaviour was categorised into three levels of meat consumption: low/no meat (vegan, vegetarian, flexitarian, pescatarian), medium meat (omnivore), and high meat (carnivore). This was based on self-reported dietary identity (see Table 1) and a dietary behaviour measure of meat consumption. Adapted from Hayley et al.[25], meat consumption was assessed by asking participants how many days a week they consumed meat[2], how many meals in a day contained meat, and how many meals per day they ate on average. Participants' meat consumption was calculated as a percentage derived from the fraction of days per week meat was eaten multiplied by the fraction of average meals consumed each day that contained meat. Distribution of responses yielded three distinct groups, corresponding to low/no, medium, and high usual meat consumption. Thus, the dietary identity measure was a valid indicator of actual meat consumption behaviour.

Environmental Charity Donation. After completing all survey questions, all participants were asked if they wished to opt into a prize draw to win one of two $50 vouchers. When presented with this question, they were given the option that if they were to win, they could either keep the voucher for themselves or opt to have $50 donated to an environmental charity on their behalf. This dichotomous measure (win vs donate) served as a proxy for PEB, similar to those used in previous research[57,67]. Importantly, this donation decision represents an objective behavioural indicator rather than a self-reported intention, strengthening the ecological validity of the PEB assessment.

2.3. Procedure

Prior to data collection, approval was given by the Murdoch University human ethics committee. After reviewing the information sheet and providing informed consent, participants completed the demographic, personality, environmental attitudes, and behavioural items in sequence online. Participants took

[2] Meat was defined to include red meat, white meat, and seafood

approximately 20 minutes to complete. On completion, participants were redirected to a separate survey link for incentive selection and to input their contact details for the prize draw, preserving data anonymity.

3. Results

3.1. Descriptive statistics and correlations

Descriptive statistics and Pearson correlations for key variables are presented in Table 2. As expected, the Dark Triad traits (Machiavellianism, narcissism, and psychopathy) positively correlated with each other, as did the Light Triad traits (Kantianism, humanism, and faith in humanity). Light and Dark Triad traits were generally negatively associated with each other. An exception was the non-significant relationship between humanism and narcissism, and between faith in humanity and narcissism. Environmental activism was significantly negatively correlated with human dominance, and positively correlated with two Light Triad traits (Kantianism and humanism), but only with one (Machiavellianism) of the Dark Triad. Further, human dominance was positively associated with all Dark Triad traits and negatively associated with two Light triad traits (Kantianism and humanism). Being a woman was associated with lower levels of psychopathy and lower human dominance attitudes, and higher levels of humanism and environmental activism. Overall, participants reported low-moderate levels of Dark Triad traits and human dominance, and higher levels of Light Triad traits and environmental activism.

Table 2. Descriptive Statistics and Correlations Among Variables

	M	***SD***	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Gender[1]	-	-	-								
Machiavellianism	2.73	0.63	.05	-							
Narcissism	2.46	0.59	-.08	**.20*****	-						
Psychopathy	2.00	0.61	**-.20*****	**.49*****	**.31*****	-					
Kantianism	4.16	0.63	.02	**-.48*****	**-.24*****	**-.46*****	-				
Humanism	4.27	0.58	**.17*****	**-.25*****	-.09	**-.28*****	**.44*****	-			
Faith in Humanity	3.52	0.83	-.05	**-.26*****	.03	**-.22*****	**.28*****	**.35*****	-		
Environmental Activism	3.48	0.89	**.18*****	-.**11***	-.06	-.03	**.13***	**.24*****	.07	-	
Human Dominance	2.07	0.99	**-.11***	**.15****	**.23*****	**.15****	**-.20*****	**-.17*****	.01	**-.52*****	-

Note. *N = 383. [1]Man = 0, woman = 1. All other gender categories excluded. *p = < .05, **p = < .01, ***p = < .001.*

3.2. Predicting pro-environmental attitudes

Two hierarchical multiple regression analyses were conducted to examine whether gender, Dark Triad and Light Triad traits predicted: (1) human dominance attitude, and (2) environmental activism attitude. Relatively high tolerances for all predictors indicated low multicollinearity. An *a priori* power analysis (G*Power 3.1; f^2 = .09[3], α = .05, power = .95) calculated approximately 245 participants were required, with our sample exceeding this threshold. As shown in Table 3, gender accounted for a very small but significant 3% of the variability in environmental activism, and 1% of the variability in human dominance (Model 1). Including the Dark and Light Triad traits (Model 2) accounted for an additional 6% of the variance in environmental activism, and an additional 8% in human dominance. Specifically, narcissism was found to positively predict human dominance but was unrelated to environmental activism. Psychopathy was

[3] Based upon previous findings by Kesenheimer and Greitemeyer[44]

unexpectedly found to positively predict environmental activism. Humanism positively predicted environmental activism but did not predict human dominance. Gender remained a significant predictor of activism in Model 2, suggesting a contribution above trait variables, while becoming non-significant in predicting human dominance.

Table 3. Regression coefficients of Predictors of Environmental Attitudes

	Environmental Activism		***Human Dominance***	
	Model 1	**Model 2**	**Model 1**	**Model 2**
	β	***β***	***β***	***β***
Gender[1]	**.18*****	**.18*****	**-.11***	-.07
Machiavellianism		-.11		.06
Narcissism		-.02		**.18****
Psychopathy		**.14***		.02
Kantianism		.04		-.09
Humanism		**.21*****		-.10
Faith in Humanity		-.01		.09
R^2	.03	.09	.01	.10
F	**12.59*****	**5.24*****	**4.25***	**5.46*****
$R^2\Delta$	-	.06	-	.08
$F\,\Delta$	-	**3.92*****	-	**5.61*****

Note. *[1]Man = 0, woman = 1. *p = < .05, **p = < .01, ***p = < .001.*

Table 3 showed limited support for H1a; although all Dark Triad traits individually correlated with dominance (see Table 2), when their shared variance was accounted for, only narcissism (positively) predicted human dominance. For H1b, only psychopathy (positively) predicted environmental activism attitudes. Similarly, H2a had limited support, with two Light Triad traits negatively correlated with human dominance, but none independently predicting this outcome in the regression. H2b had marginally more support, with two of the Light Triad correlated with environmental activism, but only one (humanism) predicted this in the regression. That is, only one Dark Triad trait (narcissism) predicted negative environmental attitudes (human dominance), while one Dark Triad (psychopathy), and one Light Triad trait (humanism) predicted positive environmental attitudes (environmental activism).

3.3. Predicting pro-environmental behaviour

Two multivariate analyses of variance (MANOVA) were performed to investigate whether personality and environmental attitudes predicted PEB, operationalised as: (1) dietary behaviour and (2) charity donation. Each included gender as a control variable. The MANOVA for dietary behaviour (no-low, moderate, or high meat diets) found that there was a significant multivariate effect for personality traits and environmental attitudes, $V = 0.16$, $F\ (16, 716) = 3.82$, $p < .001$, partial $n^2 = .08$. Analysis of individual effects of each independent variable found that the Dark and Light Triad traits were not significantly different between dietary behaviour groups (see Table 4). Environmental attitudes were significantly different between dietary behaviour groups. Those in the no-low meat diet group had significantly higher environmental activism attitudes than those in the medium, and high meat diet groups. Those in the medium meat diet group scored significantly higher in environmental activism attitudes than those in the high meat diet group. Those in the no-low meat diet group scored significantly lower in human dominance than those in the medium and high meat groups.

Table 4. Personality and Environmental Attitudes Between Dietary Behaviour Groups

	No-Low meat (a)		**Medium meat (b)**		**High meat (c)**			
	M	***SD***	***M***	***SD***	***M***	***SD***	***F* (2, 382)**	n^2
Machiavellianism	2.68	0.66	2.77	0.62	2.57	0.58	1.90	.01
Narcissism	2.48	0.63	2.44	0.59	2.55	0.54	1.78	.01
Psychopathy	1.98	0.59	2.02	0.61	1.94	0.63	1.46	.01
Kantianism	4.32	0.53	4.11	0.64	4.19	0.62	2.41	.01
Humanism	4.34	0.53	4.27	0.56	4.19	0.73	1.18	.01
Faith in Humanity	3.55	0.73	3.50	0.85	3.57	0.86	0.23	.00
Environmental Activism	**4.02**^{bc}	0.86	**3.46**^{ac}	0.84	**2.76**^{ab}	0.84	**22.94*****	.11
Human Dominance	**1.57**^{bc}	0.70	**2.11**^{a}	0.98	**2.57**^{a}	1.1	**12.34*****	.06

Note. *^{a} = significantly different from no-low meat diet, ^{b} = significantly different from medium meat diet, ^{c} = significantly different from high meat diet. $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$.*

The MANOVA for environmental charity donation found that there was a significant multivariate effect for personality and environmental attitudes, $V = .15$, F (8, 267) = 5.78, $p = <.001$, partial $n^2 = .15$. As seen in Table 5, narcissism, psychopathy, and Kantianism, environmental activism, and human dominance attitudes were significantly different between those who chose to donate vs. those who opted to keep their potential winnings.

Table 5. Personality and Environmental Attitudes Between Levels of Environmental Charity Donation

	Win		**Donate**			
	M	***SD***	***M***	***SD***	***F* (1, 274)**	n^2
Machiavellianism	2.76	0.60	2.67	0.64	0.26	.00
Narcissism	**2.64**	0.62	**2.33**	0.55	**15.58*****	.05
Psychopathy	**2.12**	0.64	**1.92**	0.58	**4.61***	.02
Kantianism	**4.01**	0.69	**4.23**	0.58	**4.28***	.02
Humanism	4.22	0.65	4.29	0.55	0.21	.00
Faith in Humanity	3.47	0.83	3.54	0.82	0.24	.00
Environmental Activism	**3.11**	0.92	**3.62**	0.83	**20.03*****	.07
Human Dominance	**2.39**	1.00	**1.89**	0.92	**12.03*****	.04

Note. *Win = 0, donate = 1. $^{*}p < .05$, $^{**}p < 0.01$, $^{***}p < .001$*

H1c had limited support, with no Dark Triad traits predicting pro-environmental dietary behaviour but narcissism and psychopathy (negatively) predicting charity donation. Outcomes were more limited for H2c, with no differences in dietary behaviour, and only Kantianism predicting charity donation, with higher scores associated with greater likelihood of donating.

As per Table 5, narcissism, psychopathy and Kantianism all predicted environmental charity donation. To test whether the relationships between these three traits and environmental charity donation were mediated by environmental attitudes, a series of binomial hierarchical logistic regressions were conducted, with gender as a control variable. Assumption testing did not indicate any violations. As shown in Table 6, both Model 1 and Model 2 for the logistic regression analysis for narcissism and environmental activism, were statistically significant, with Model 2 a significant improvement over Model 1 (Model 1: Cox & Snell

R^2 = .07; 62.2 accuracy; Model 2: Cox & Snell R^2 = .14, 65.8% accuracy). Similarly, Model 2 for narcissism and human dominance was statistically significant, with Model 2 a significant improvement over Model 1 (same as above; Model 2: Cox & Snell R^2 = .10, 66.9%). As shown in Table 6, while narcissism and the two environmental attitudes both significantly predicted donation, there was little change in b value for narcissism, suggesting no mediation.

Similarly, the logistic mediated regressions for psychopathy showed minimal evidence of change in psychopathy between Models 1 and 2 (see Table 6). For environmental activism attitude, Model 1 and Model 2 were both significant overall, and Model 2 was an improvement over Model 1 (Model 1: Cox & Snell R^2 = .03, 59.0% accuracy; Model 2: Cox & Snell R^2 = .10, 65.1% accuracy); however, psychopathy's *b* value was largely unchanged. Model 2 for human dominance was also significant overall, and a significant improvement (Model 1: as above; Model 2: Cox and Snell R^2 = .08, 65.5% accuracy). Psychopathy did become non-significant after human dominance was added, suggesting full mediation, although initial psychopathy odds ratio was close to 1.

For mediation of Kantianism, Model 1 was significant (Cox & Snell R^2 = .03, 56.5% accuracy), with both Model 2s also increasing variance explained (activism attitudes Model 2: Cox & Snell R^2 = .09, 65.8% accuracy; Human dominance Model 2: Cox & Snell R^2 = .08, 66.5% accuracy). There was a slight decrease in Kantianism's *b*-value for activism attitudes, and it became non-significant in the Human Dominance regression. This suggested some evidence for mediation for only one Light Triad trait on environmental attitudes for one PEB[4].

Taken together, these findings suggested minimal support for H5a and H5b. For Dark Triad (H5a) narcissism was not mediated by environmental attitudes, but psychopathy showed some evidence of mediation by human dominance. For Light Triad (H5b), Kantianism showed some evidence of mediation by both environmental attitudes, although the effect was marginal. The environmental attitudes variables produced more significant odds ratios in all cases, suggesting that they are stronger predictors than personality traits. This affirms findings in Tables 4 and 5, where attitudes significantly predicted both PEBs independently of all other IVs.

[4] For transparency, all mediation analyses were also run without gender. There were very minimal changes in coefficients for any of the mediations (second decimal place only). The only full mediation was still Kantianism by human dominance.

Table 6. Mediation Model Coefficients for Environmental Attitudes and Narcissism, Psychopathy, and Kantianism on Environmental Charity Donation

		Model 1				***Model 2***			
		b	***SE***	***OR***	***95% CI***	***b***	***SE***	***OR***	***95% CI***
Narcissism and Activism	Gender	0.18	0.30	1.20	0.67, 2.14	-0.09	0.32	0.91	0.49, 1.70
	Narcissism	**-0.91*** **	0.22	**0.40**	**0.26, 0.62**	**-0.96*** **	0.23	**0.39**	**0.25, 0.60**
	Environmental Activism					**0.68*** **	0.16	**1.98**	**1.46, 2.68**
	χ^2	**19.17*** **				**40.75*** **			
	$\chi^2\Delta$					**21.58*** **			
Narcissism and Human Dominance	Gender	0.18	0.30	1.20	0.67, 2.14	0.10	0.30	1.10	0.61, 2.00
	Narcissism	**-0.91*** **	0.22	**0.40**	**0.26, 0.62**	**-0.77*** **	0.23	**0.46**	**0.30, 0.72**
	Human Dominance					**-0.42*** **	0.13	**0.65**	**0.51, 0.84**
	χ^2	**19.17*** **				**30.11*** **			
	$\chi^2\Delta$					**10.95*** **			
Psychopathy and Activism	Gender	0.15	0.29	1.16	0.65, 2.07	-0.23	0.31	0.88	0.48, 1.63
	Psychopathy	**-0.52***	0.21	**0.60**	**0.40, 0.90**	**-0.54***	0.22	**0.58**	**0.38, 0.89**
	Environmental Activism					**0.67*** **	0.15	**1.95**	**1.44, 2.62**
	χ^2	**7.39*** **				**28.49*** **			
	$\chi^2\Delta$					**21.10*** **			
Psychopathy and Human Dominance	Gender	0.15	0.29	1.16	0.65, 2.07	0.07	0.30	1.07	0.59, 1.94
	Psychopathy	**-0.52***	0.21	**0.60**	**0.40, 0.90**	-0.40	0.22	0.68	0.44, 1.02
	Human Dominance					**-0.47*** **	0.13	**0.62**	**0.49, 0.80**

		Model 1				***Model 2***			
		b	***SE***	***OR***	***95% CI***	***b***	***SE***	***OR***	***95% CI***
	χ^2	**7.39*** **				**21.63*** **			
	$\chi^2\Delta$					**14.24*** **			
Kantianism and Activism	Gender	0.30	0.29	1.35	0.77, 2.38	0.50	0.31	1.05	0.58, 1.91
	Kantianism	**0.53****	0.20	**1.70**	**1.16, 2.50**	**0.46***	0.20	**1.58**	**1.06, 2.33**
	Environmental Activism					**0.63*** **	0.15	**1.84**	**1.39, 2.53**
	χ^2	**8.78*** **				**27.41*** **			
	$\chi^2\Delta$					**18.63*** **			
Kantianism and Human Dominance	Gender	0.30	0.29	1.35	0.77, 2.38	0.19	0.30	1.21	0.68, 2.17
	Kantianism	**0.53****	0.20	**1.70**	**1.16, 2.50**	0.39	0.20	1.48	1.00, 2.20
	Human Dominance					**-0.46*** **	0.13	**0.63**	**0.49, 0.82**
	χ^2	**8.78*** **				**21.95*** **			
	$\chi^2\Delta$					**13.17*** **			

Table 6 (*Continued*)

Note. *N = 278 for all models. OR = odds ratio; SE = standard error; CI = confidence interval. An odds ratio < 1 indicates lower odds of donating; > 1 indicates higher odds. *p < .05, **p < 0.01, ***p < .001*

4. Discussion

The current study sought to examine the role of personality traits, specifically the Dark and Light Triads, and environmental attitudes in predicting PEB, operationalised as dietary behaviour and environmental charity donation. Contrary to hypotheses, personality traits alone were poor predictors of dietary behaviour but showed some utility when predicting environmental charity donation.

While Dark Triad traits were positively associated with human dominance attitudes, these relationships did not translate to directly predicting environmentally-relevant attitudes or behaviours when considered independently, except for narcissism positively predicting human dominance, psychopathy positively predicting environmental activism, and both narcissism and psychopathy negatively predicting charity donation. The predictive utility of narcissism aligns with previous research indicating that narcissistic individuals were less inclined towards sustainable behaviours due to a focus on personal gain and self-interest[43]. The predictive utility of psychopathy supports prior evidence that psychopathy entails a focus on immediate self-gain[41]. Even when the personal cost is minimal (i.e., possible prize money), the lack of empathetic concern and moral restraint, characteristic of psychopathy, likely reduced the appeal of charitable giving. However, these results conflict with previous research[51], where Machiavellianism was found to negatively predict pro-environmental attitudes. These conflicting results may be somewhat explainable by the differing environmental attitudes assessed across the current and Huang et al.[51] studies. Only three items in the New Ecological Paradigm Scale[68] (used by Huang et al.) refer to human dominance, and most items focus on the ecological limits of the Earth and restoration of the balance of nature, and no items refer to activism. Hence, it may be that different types of environmental attitudes have differing correlates. Indeed, it makes conceptual sense that narcissism would be especially aligned with attitudes of human dominance over nature; hierarchical dominance likely reinforces narcissists' worldviews centred around their own entitlement and superiority, affirming their beliefs that they are subsequently justified in using nature as a source of self-enhancement and gratification[34,39].

Psychopathy was unexpectedly found to positively predict environmental activism, contradicting prior findings that typically associate psychopathy with low empathy and disregard for collective wellbeing[41,53]. There was no simple correlation though, so this may have been a statistical artifact, and psychopathy negatively predicted environmental charity donation alone and in mediation analysis. Another possible interpretation is that individuals high in psychopathy might superficially endorse activism to gain social approval/confirm with social norms or manipulate perceptions, particularly if activism is perceived as socially desirable or status-enhancing, a pattern previously exhibited with narcissism[56]. Indeed, self-enhancement and impression management tendencies have been exhibited in other samples of non-clinical psychopaths[33], particularly in contexts where 'green' attitudes are positively perceived. However, since the anonymous nature of the current study complicates this self-enhancement interpretation, future research could further explore this paradox through qualitative methods or behavioural observations to determine genuine engagement versus superficial endorsement.

Regarding the Light Triad traits, the anticipated positive relationships with pro-environmental attitudes and behaviours were broadly not confirmed. Only humanism positively predicted environmental activism attitudes, partially confirming previous literature suggesting this trait facilitates moral concern and prosocial orientation[35]. Further, Kantianism predicting charity donation aligned with the theoretical grounding of this variable in deontological ethics, with an emphasis on an inherent moral duty to treat others (including future generations) as end to themselves, rather than means to achieve other goals. This finding empirically aligns with research linking Kantianism to prosocial behaviour[45]. Overall, the limited predictive value of Light

Triad traits may be due to ceiling effects within a broadly socially and environmentally conscious sample. Another possibility is that Light Triad traits influenced behaviour indirectly by fostering moral concern, which was already captured in our model by pro-environmental attitudes. This interpretation aligns with the theoretical distinction that personality traits represent distal predispositions, whereas environmental attitudes are more proximal cognitive drivers of behaviour.

Environmental attitudes emerged as significant and consistent predictors of both dietary behaviour and charity donation. Participants endorsing higher environmental activism and lower human dominance attitudes were significantly more likely to adopt no-low meat diets and opt for environmental charity donations over personal gain. These findings reinforce previous research indicating that pro-environmental attitudes are strong proximal predictors of PEB[19,25]. The use of a behavioural measure of PEB strengthens this conclusion, addressing concerns about reliance on only self-report data in much of the extant literature. This finding offers empirical support for the argument that attitudes sit closer to behaviour within a casual pathway and therefore exert stronger predictive power than traits. Dual-process frameworks suggest that environmentally relevant decisions may rely on immediate affective evaluations rather than trait-based dispositions, explaining the stronger impact of attitudes on PEB. Additionally, because environmental attitudes are socially desirable, they may be more salient and influential in contexts involving self-report and behaviour.

Contrary to theoretical expectations, there was minimal evidence of mediation by attitudes between personality and PEB. Only human dominance mediated the effect of one Dark trait (psychopathy), and one Light trait (Kantianism), on one PEB (charity donation). Further, activism showed some evidence of mediation for Kantianism on charity donation. The limited mediation may reflect the limited direct effects that personality traits exert on specific environmental actions, leaving insufficient variance to be transmitted through attitudinal pathways. These results contrast with prior findings from HEXACO-based research[57], where the relationship between honesty-humility and PEB was fully mediated by environmental attitudes. One explanation for this divergence may lie in differences in construct alignment. Honesty-humility is closely linked to moral norm adherence and fairness, which operate as rule-based moral constraints. Subsequently, these may translate more readily into environmentally relevant attitudes, which themselves are morally framed constructs. In contrast, Dark and Light Triads capture broader socially strategic orientations that may shape environmental worldviews without consistently activating norm-based environmental concern, leading to weaker mediation pathways. Alternatively, it may suggest a conceptual mismatch between the levels of abstraction across constructs in this model; traits are broad and stable, whereas environmental attitudes and specific behaviours are more situationally activated and may fluctuate based on context[5]. Such discrepancies may weaken indirect effects.

Gender differences were largely consistent with previous research[48,61]. Women demonstrated stronger pro-environmental attitudes and lower endorsement of human dominance attitudes compared to men, as well as lower psychopathy and higher humanism. In the present study, gender was included as a control variable; however, our findings indicate that gender functioned as a meaningful covariate and may function as a sociocultural marker shaping environmental attitudes and behaviours. These results align with literature attributing gender differences in environmentalism to socialisation processes, empathic tendencies, and ethical considerations regarding animal welfare[58,59].

4.1. Implications for theory and practice

These findings suggest that interventions aiming to promote sustainable behaviours may be most effective if they focus on attitude modification. While personality is largely stable in adulthood, attitudes can

be shaped through education, persuasive messaging, and altering social norms[69]. For instance, environmental education programs could emphasise the utility of environmental activism and challenge anthropocentric worldviews to encourage pro-environmental dietary choices and increase pro-environmental donations. Findings also underscore the value of multi-domain behavioural assessment: the consistency of attitude effects across dietary and donation contexts suggest that environmental attitudes influence a broad suite of environmentally relevant decisions, supporting interventions that generalise across behavioural domains.

This study's theoretical model claimed distal traits (e.g., personality) influenced more proximal cognitive constructs (e.g., attitudes), which in turn influenced behaviour. However, the limited evidence of mediation effects suggested that further work is needed to clarify the causal pathways and to integrate attitudinal-based models with trait psychology. There may be more utility in measuring the impact of states (rather than traits) on behaviour[19]. While some previous research has identified relationships between personality and PEB, the current findings highlight that specific attitudes rooted in environmental values offer clearer explanatory value of environmentally relevant behaviours. This places ethical and moral cognitions at the centre of behavioural prediction.

4.2. Limitations and future directions

Future research should address limitations inherent in the current design. Given theoretical claims that personality shapes attitudes, and attitudes then shape behaviour, longitudinal or experimental methodologies could better establish directionality and causality in these relationships. Second, given the demographic limitations of a predominantly female, university-educated, and environmentally conscious sample, replication with more diverse population is recommended to confirm generalisability and address potential ceiling and floor effects in personality measures. Third, a broader range of (both pro- and anti-) environmental attitudes could be considered to assess their differential correlates. Fourth, while the inclusion of both self-report and behavioural measures strengthened validity in measuring PEB, the donation measure was limited to a single binary choice about a potential prize win. Results may be more robust if presenting participants with an in-the-moment choice between taking money now or donating to charity, rather than donating potential future winnings. It would also be useful to assess the interrelationships between a range of behavioural indicators of PEB (e.g., volunteering, protesting, consumption and recycling, and meat consumption) and better understanding the gendered patterns in these variables may help refine models of PEB. Although gender was statistically controlled, the overrepresentation of women may limit the generalisability of findings. Future studies should aim for a more gender-balanced sample and consider examining gender as a moderator. Given the importance of gender in the models, future research is encouraged to further delineate the extent to which these differences are driven by socialisation processes or by underlying personality differences as these pathways likely have implications for the design of gender-sensitive interventions. Finally, the internal reliability of Kantianism was modest, and future research should refine the Light Triad scale to improve psychometric robustness or consider alternative measures. Lower reliability reduces the stability of obtained relationships and may partially explain the weaker than expected predictive and mediating effects for Light Triad.

4.3. Conclusions

Collectively, the findings of this study highlight the primacy of environmental attitudes in predicting PEB across behavioural domains. While personality traits may inform individual worldviews, only certain traits with strong moral or antisocial orientations (e.g., Kantianism, psychopathy, narcissism) influence specific pro-environmental choices (donation). The results thus advocate for targeted interventions designed

to shape and reinforce environmental attitudes, specifically highlighting the benefits of environmental activism and reducing anthropocentricism, to effectively promote sustainable behaviours. Future research should continue to examine the complex interplay between traits, attitudes, and behaviour using longitudinal and multi-method approaches.

Author contributions

Conceptualization, AS, and BH; methodology, AS, BH, and CR; formal analysis, BH and CR; investigation, CR; data curation, CR, BH; writing—original draft preparation, CR, AS; writing—review and editing, AS, BH, CR; supervision, AS, BH.; project administration, AS, BH. All authors have read and agreed to the published version of the manuscript.

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Conflict of interest

The authors declare no conflict of interest

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