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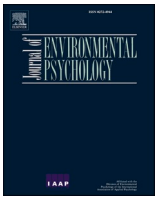

When and how pro-environmental attitudes turn into behavior: The role of costs, benefits, and self-control

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ABSTRACT

Despite a strong consensus about humanity's responsibility for climate change, many people fail to behave in line with their pro-environmental attitudes, and the question of how to overcome this environmental attitude-behavior gap remains a puzzle. To address this lacuna, the present research provides further insights into motivational, dispositional, and structural factors underlying pro-environmental behavior. Based on a decision-task with actual environmental consequences (n = 1,536), we show that pro-environmental attitudes are more predictive of pro-environmental behavior when personal costs are low or environmental benefits are high. Importantly, self-control helps people to act in line with their attitudes, suggesting that self-control is a crucial trait for protecting people's long-term pro-environmental goals. We propose that mitigation strategies should take into account the motivational, dispositional, and structural complexity associated with pro-environmental decisions.

1. Introduction

Climate change leads to severe and most likely irreversible changes affecting ecosystems and humanity, making it perhaps the most central environmental issue of the 21st century. In order to minimize its adverse consequences, it is suggested to limit global warming to less than 1.5° Celsius above its preindustrial level, which requires a decline in global carbon dioxide (CO_2) emissions of about 45% by 2030 (Hoegh-Guldberg et al., 2018). As a significant proportion of these emissions trace back to the accumulation of individual energy choices (Rosa & Dietz, 2012), rapid and drastic changes in people's lifestyles are demanded.

Despite the need for individual action, environmental research has not yet devoted enough attention to the complexity underlying people's pro-environmental decision-making (Creutzig et al., 2018). Ignoring the full scope of economic and psychological insights on mitigation behavior may, however, lead to ineffective policy-instruments grounded in overly simplistic assumptions about human behavior, and therefore threaten effective progress towards more sustainability (Clayton et al., 2015; Nielsen et al., 2020). For example, many policies have placed a high emphasis on intervention campaigns that uniquely focus on shaping pro-environmental attitudes and raising awareness about the adverse effects of climate change (Abrahamse et al., 2005; McKenzie-Mohr, 2000). Although such campaigns have shown to contribute to the public's understanding of climate science and have increased people's sense of responsibility (Moser, 2010), positive environmental attitudes and intentions are, unfortunately, not always and entirely reflected in people's behavior (Carrington et al., 2014; Juvan & Dolnicar, 2014; Kennedy et al., 2009; Kollmuss & Agyeman, 2002). This environmental attitude-behavior gap has attracted a lot of attention among behavioral and cognitive scientists, but although many studies have been undertaken, we do not yet have a full understanding of the mechanisms causing this discrepancy (Gifford & Chen, 2017; Gifford & Sussman, 2012; Kollmuss & Agyeman, 2002).

The present research therefore contributes to this literature by taking a closer look at the conditions under which behavior can be brought in line with pro-environmental attitudes and how looking at individual differences in trait self-control can help to provide a better understanding of environmental decision-making.

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1.1. Barriers hindering environmental attitudes to fully translate into behavior

Among other factors (e.g., Carmi et al., 2015; Claudy et al., 2013; Kollmuss & Agyeman, 2002; Martinsson et al., 2011; Meinhold & Malkus, 2005), previous research has pointed to situational constraints, such as the lack of access to public transport or green products (Nguyen et al., 2019), and cultural factors (Eom et al., 2016) that make it hard for people to behave in line with their pro-environmental attitudes. However, even if contextual factors in principle enable pro-environmental behavior, people often fail to act accordingly (Kollmuss & Agyeman, 2002). Another long-standing explanation is that people with high environmental attitudes predominantly engage in pro-environmental behavior if the perceived actual or opportunity cost is sufficiently low (Diekmann & Preisendörfer, 1992, 2003; Farjam et al., 2019; Guagnano et al., 1995). This helps to explain why attitudes are typically found to predict various "low-cost" pro-environmental behaviors such as recycling (Barr, 2007), but often fail to explain "high-cost" behaviors such as driving or flying less (Alcock et al., 2017; Diekmann & Preisendörfer, 2003). On the other hand, it has been theorized that people are more likely to behave pro-environmentally when the environmental benefit associated with incurring such costs is perceived to be high (Steg & Vlek, 2009). For example, if people must choose between using the bicycle and going by car, they might ponder whether it is worth accepting the cost of foregoing a comfortable car ride in relation to the generated benefit to the environment. If the relative environmental benefit is regarded as being low, traveling by car is, consequently, more likely to be the chosen option. Importantly, empirical findings provide indirect support of this theoretical claim by showing that people strongly underestimate the environmental impact of their behaviors, and that correcting these misperceptions with easy-to-interpret consumer labels leads to a decrease in high-emission product choices (Camilleri et al., 2019; Larrick et al., 2015; Vandenbergh et al., 2011). By making the perceived environmental harm of consumption goods more transparent and correcting the underestimation thereof, the willingness to consume such goods may thus decrease.

1.2. A self-control perspective on the environmental attitude-behavior gap

Despite these advances, however, it remains unclear why positive environmental attitudes often fail to predict environmental behavior even if people are in principle willing to bear the personal costs of a pro-environmental choice and are aware of the associated environmental benefits. Therefore, scientists have called for more research on the cognitive foundations of environmental decision-making (Bamberg, 2013; Nielsen, 2017; Weber, 2017), which corresponds to the general demand for more process-knowledge to better understand human behavior (Crusius et al., 2012; Nielsen et al., 2020). Taking a cognitive perspective on the environmental attitude-behavior-gap, self-control capacity has been theorized as an especially important variable underlying peoples' (in)ability to act on their pro-environmental attitudes. In general, people need self-control when confronted with a conflict between two mutually exclusive motives: one more potent motive that is expected to generate a proximal reward, and one less potent motive that promises a greater long-term reward (Duckworth et al., 2016). In such situations, self-control capacity can help people to bring their behavior in line with their long-term goals (Hofmann et al., 2012; Milyavskaya & Inzlicht, 2017), for example through the effortful inhibition of temptations that allow short-term gratification (Fujita, 2011). Although this capacity can be affected by situational influences (Hofmann et al., 2012), people also differ considerably and chronically in their general disposition to exert self-control. In fact, this trait is assumed to be relatively stable over time and across situations (Gottfredson & Hirschi, 1990) and has been associated with substantial benefits in many aspects of life (e.g. Tangney et al., 2004).

Research in cognitive science and neuroscience provides initial support for the assumption that trait self-control may similarly benefit pro-environmental decision-making. For example, previous research has found that working memory capacity (Langenbach et al., 2020) or baseline activation in a related brain area (i.e. right lateral prefrontal cortex; Langenbach et al., 2020) is linked to people's self-reported daily pro-environmental behavior. This suggests that people's cognitive resources, such as self-control capacity, may act as a resource to resist carbon-intensive personal benefits in order to shield the long-term goal of contributing to climate change mitigation (Baumgartner et al., 2019; Langenbach et al., 2020). However, it still remains unclear whether trait self-control can actually help people behave in line with their pro-environmental attitudes, and whether previous findings on cognitive resources translate to actual, not self-reported pro-environmental decision-making.

1.3. Contribution of the present study

The goal of the present research is to look at motivational, dispositional and structural contributors to the attitude-behavior-gap by empirically investigating the role of pro-environmental attitudes and trait self-control in environmental decision-making under varying personal costs and environmental consequences. First, we rely on a novel decision-making task (Berger & Wyss, 2021) that allows us to quantify and experimentally vary different levels of environmental and financial consequences. This allows us to provide laboratory evidence for the environmental attitude-behavior gap under controlled settings and to show that the gap is sensitive to situational factors. On the one hand, we aim to replicate the well-established low-cost hypothesis (Diekmann & Preisendörfer, 2003) by showing that participants are more likely to behave in line with their pro-environmental values when opportunity costs are low (moderation 1). On the other hand, we aim to extend these findings to environmental costs (Steg & Vlek, 2009) by looking at whether people are more willing to behave sustainably when the environmental benefit associated with such behavior is perceived to be high (moderation 2). As a main contribution, we test our central and pre-registered hypothesis that people with high levels of trait self-control behave more in line with their pro-environmental attitudes compared to individuals with low self-control levels (moderation 3).

2. Methods

Our study consists of four sessions. Designs, analyses, and our central hypothesis were pre-registered using *As Predicted* and the *OSF* (Session 1: https://osf.io/blinded to protect double-blind review; Session 2: https://osf.io/blinded; Session 3: https://osf.io/blinded; Session 4: https://osf.io/blinded), all statistical tests reported are based on two-sided hypothesis tests, and all covariates are reported. We confirm that for all sessions, we have reported all measures, conditions, and data exclusions. Sample size decisions were made based on budgetary constraints (Lakens, 2021).

In total, all of the four sessions were identical regarding the collected variables. Thus, we collapsed the data of all sessions and report the integrative results while controlling for between-session heterogeneity by adding dummy variables for the sessions in our fitted models to denote time and platform of data collection as a fixed characteristic of each individual observation, as suggested by Curran and Hussong (2009). In addition to the integrative analysis presented in the main manuscript, we present analyses for each individual session in Tables S2-S4. Additionally, the data reported in the main text includes only participants who correctly answered the comprehension check, an approach that was pre-registered. The comprehension check tapped into participants' understanding of the real consequences of their behavior. Across all sessions, 89.9 percent of participants answered the question correctly. An additional analysis including participants with wrong answers to the comprehension check while controlling for comprehension is provided in Table S5, corroborating all central results. All data and

code are provided using the *OSF* (https://osf.io/wc2f6).

2.1. Participants

Participants (final sample: $n = 1{,}536$, 42.3% females; mean age: 35 years) took part in a controlled behavioral experiment on environmental decision-making conducted in four identical sessions. In session 1, participants (final sample: n = 181) were recruited on Amazon Mechanical Turk. Participants received the prospect of a behavior-dependent bonus of up to one USD next to a flat payment of one additional USD. Expected completion time was 10 min and participants were allowed to take up to 25 min. Session 2 was an exact replication of session 1 using Amazon Mechanical Turk with an increased sample size (final sample: n = 703). Session 3 was an exact replication of session 1 with respondents recruited from a more diverse subject pool recruited on the academic platform Prolific (final sample: n = 546). For sessions 1 and 2, respondents came uniquely from the US, for session 3, geographic diversity was large and participants came from at least 30 countries, the majority being from the UK with 32 percent, followed by Portugal with 15 percent, the US with 6 percent, and Italy, Canada, Greece, and Spain with about 4 percent each. Session 4 again replicated session 1 but included a student sample from a large university in Switzerland and included different financial stakes (see section 2.4.1). Participants (final sample: n = 106) were recruited in the initial session of a class on organizational psychology with no prior experience on the topic of the study. Due to the Covid-19 epidemics, some students (n = 36) absent from the classroom were invited to complete the study online and were paid electronically.

2.2. Procedure

In each session, we began by explaining participants the main decision-making task. Participants learnt that they would make 25 decisions (1 per trial) that may affect their bonus payment. In each of the 25 trials, they were asked to decide between two options. The trials were identical in principle, but with a different environmental externality (i.e. CO_2 emissions) and monetary benefit (i.e. bonus opportunities; see task description below for details). At this point, participants were also informed that carbon dioxide is regarded as a key contributor to climate change and scientists around the globe agree that climate change can only be mitigated if carbon emissions are dramatically reduced.

Next, participants learnt that the exact emission and bonus would be based on a randomly drawn trial from the 25 trials. After finishing the instructions, participants completed a non-incentivized and non-time-restricted practice decision and had to answer a comprehension question.

After making their decisions, participants completed a series of self-report scales and answered various demographic questions. After finishing their respective session, participants learnt that they would receive their payment within a week, depending on the session either through the platforms Amazon Mechanical Turk or Prolific or by means of cash disbursed in a coded envelope to secure anonymity in the classroom sample.

2.3. Measures

2.3.1. Carbon emission task

In order to capture actual and consequential environmental decision-making, we rely on a new experimental economic choice paradigm coined the carbon emission task (Berger & Wyss, 2021). It allows to study the individual trade-off between personal short-term gains and long-term environmental goals by directly pitching financial rewards against people's motive to avoid carbon emissions. In the task, people face decisions involving financial consequences that are paired with environmental burdens by means of an actual carbon emission. This is realized using the EU carbon emission "cap and trade" system (EU-ETS, similar in Ockenfels, 2020; or Tavoni et al., 2011). The EU-ETS regulates the quantity of CO_2 emissions made by large polluters in the Euro zone (e.g., energy firms, airlines operating within-EU flights, etc.). Each polluter is endowed with certificates allowing the emission. Certificates are tradable in a market. However, it is possible for individuals to purchase and "destroy" (i.e. retire) certificates from the market, thereby strengthening the cap. Buying and retiring certificates thereby consequentially reduces the total global emissions. In the carbon emission task, these purchases are made contingent on participant behavior. This is made possible by professional service providers that allow certificate purchases even in small quantities. The service provider for the current study is the firm CO_2 Esto (www.co2esto.com; certificate number: 3911/2019/1406425685).

In the carbon emission task (see SI for exact instructions of the task), participants faced repeated trade-offs between a financially rewarding Option A and a financially non-rewarding, but carbon-neutral Option B (see Fig. 1). Thus, Option A always included an unsustainable financial reward, whereas Option B never yielded a financial benefit, but was environmentally-friendly. As previous research has highlighted the importance of supporting individuals with familiar reference units to better make sense of environmental information such as "lbs. CO_2 emitted" (Camilleri et al., 2019), the amount of carbon emitted in Option A was also provided in "equivalent car miles driven".

In order to modulate the level incentives and consequences of Option A systematically, we fully crossed five different levels of financial rewards (i.e., 20, 40, 60, 80, 100 cents) with five different amounts of emission (i.e., 0, 0.23, 1.02, 4.46, 19.85 lbs. CO_2) and randomly presented this set of 25 trials to participants. Session 4 slightly differed from sessions 1–3: the decisions as such and the self-report scales were held congruent across all sessions, but the monetary stakes were increased by factor 10, and accordingly, the environmental harm. Instead of bonus opportunities of 20, 40, 60, 80, and 100 cents, participants received bonus opportunities of 2, 4, 6, 8, and 10 CHF, but were also faced with ten times higher emissions, translated into kilograms of CO_2 and kilometers driven in a car. This allowed us to match participants' payments to the typical rate for studies conducted in Switzerland. Note that different bonus or emission levels between sessions 1–3 and session 4 did not affect the way participants responded to these levels within each study (see Fig. S1), which is why we collapsed all data without any further transformation. However, we controlled for between-session heterogeneity by including each session as a fixed effect. Throughout the 25 trials, participants were time-restricted and had 15 s to complete each trial in order align the completion time between participants. Not making the decision meant that the bonus opportunity is foregone. However, timing out occurred rarely. In addition to a flat payment for participation, one trial was randomly selected for payoff.

2.3.2. Questionnaires

In order to assess participants' trait self-control, we used the Brief Self-Control Scale (BSCS; Tangney et al., 2004). Participants rated 13 items on a 5-point scale ranging from 1 *not at all like* me to 5 *very much*

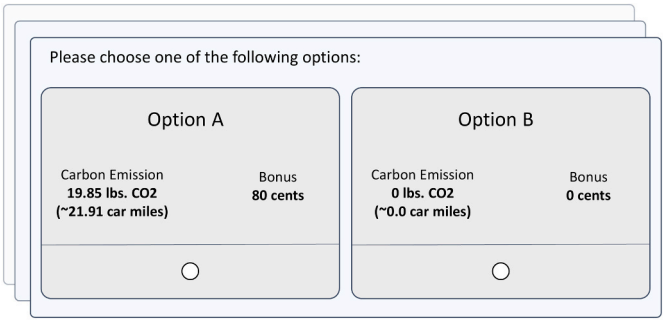

Fig. 1. Illustration of the carbon emission task.

like me. In addition, we assessed participants' pro-environmental attitudes using the 15-item New Environmental Paradigm Scale (NEP-R; Dunlap et al., 2000). Answers ranged from 1 *strongly disagree* to 5 *strongly agree*. The internal consistency of the BSCS (Cronbach's $\alpha = 0.87$) and NEP-R (Cronbach's $\alpha = 0.86$) was good across all as well within each session, see Supplementary Information (SI) for more information. As control variables, we also collected religiousness (single item measure ranging from 1 *definitively not* to 5 *definitively yes*) and political views (1 *very liberal* to 7 *very conservative*), which have been associated with pro-environmental behavior (e.g., Klein et al., 2019; Eom et al., 2021). Other independent (i.e. control) variables used were demographic in nature (i.e., income, employment, education, age, gender). See the SI for all materials used and the exact wording of the questionnaires.

3. Results

3.1. Moderating effect of opportunity costs

First, we analyzed whether the bonus level associated with each choice moderates the relationship between pro-environmental attitudes and pro-environmental choices. In line with the low-cost hypothesis, the relationship between environmental attitudes and behavior is stronger when the personal cost (i.e. opportunity cost) of foregoing the bonus opportunity is low. In other words, when making a pro-environmental decision is relatively easy (i.e. low opportunity costs), environmental attitudes are a better predictor of pro-environmental behavior than when the incentives to pollute are high. Table 1 displays the regression results, showing a significant interaction effect of environmental attitudes and bonus level, both without ($p < .001$, Model 1) and with control variables ($p < .001$, Model 2). Fig. 2A depicts the interaction effect of environmental attitudes and level of bonus on the probability to make a pro-environmental decision (i.e. foregoing the bonus). Fig. 2B shows that the effect of pro-environmental attitudes on the probability to forego the bonus remains significant across all bonus levels, but strongly decreases when the bonus payment rises. From the set of control variables, only political views were significantly associated with the dependent variable, meaning that more liberal participants showed more pro-environmental behavior.

Table 1
Interaction effect of pro-environmental attitudes (NEP) x bonus level from a mixed-effects logistic regression with foregoing unsustainable bonus opportunity as dependent variable.

Predictors	Model 1			Model 2		
	Odds Ratios	*CI*	*p*	*Odds Ratios*	*CI*	*p*
(Intercept)	0.40	0.29–0.56	**<.001**	0.32	0.15–0.67	**.003**
NEP	2.45	2.03–2.97	**<.001**	2.22	1.80–2.73	**<.001**
Bonus level	0.98	0.98–0.99	**<.001**	0.98	0.98–0.99	**<.001**
NEP * Bonus level	1.00	0.99–1.00	**<.001**	1.00	0.99–1.00	**<.001**
Age				1.00	0.99–1.01	.652
Gender (1 if female)				1.05	0.82–1.33	.697
Highest Education				1.03	0.95–1.13	.449
Political views				0.89	0.83–0.96	**.001**
Income (dummy coded)	NO			YES		
Session (dummy coded)	YES			YES		
Random Effects						
σ^2	3.29			3.29		
τ_{00}	4.34 $_{participants}$			4.22 $_{participants}$		
ICC	0.57			0.56		
N	1,531 $_{participants}$			1,447 $_{participants}$		
Observations	37,867			35,786		
Marginal R^2/ Conditional R^2	0.138/0.628			0.149/0.627		

Note. The dependent variable refers to whether participants made a pro-environmental decision (coded "1") or not (coded "0"). To facilitate interpretation, NEP is entered as a mean-centered variable. Number of subjects vary due to missing values.

3.2. Moderating effect of environmental harm

The results presented above suggest that decision-makers align their pro-environmental attitudes and behavior to a lesser extent when the personal cost for a pro-environmental choice is high. Next, we examined whether pro-environmental attitudes are more predictive of corresponding behavior when its environmental benefit is high. Therefore, we analyzed whether the carbon emission associated with each choice moderates the relationship between pro-environmental attitudes and pro-environmental decisions. As expected, the relationship between environmental attitudes and corresponding behavior is stronger when the environmental benefit of foregoing the bonus opportunity is high. In other words, people are more likely to behave in line with their environmental attitudes when the environmental consequences are more significant. Table 2 displays the regression results, showing a significant interaction effect of environmental attitudes and carbon emission, both without ($p < .001$, Model 1) and with control variables ($p < .001$, Model 2). Fig. 3A depicts the interaction effect of environmental attitudes and carbon emission on the probability to make the pro-environmental choice (i.e. foregoing the bonus). Fig. 3B illustrates that the effect of pro-environmental attitudes on the probability to forego the bonus remains significant across all carbon emission levels included in our study, but strongly increases with rising emissions.

3.3. Moderating effect of trait self-control

Taken together, the results above highlight that there is a considerable environmental attitude-behavior gap, which is more pronounced when personal opportunity costs are high, or (perceived) environmental benefits are low. Next, we test our central hypothesis whether self-control capacity may serve as a resource for people to help them align their pro-environmental behavior and attitudes. Fig. 4A illustrates this finding by displaying a significant interaction effect of self-control and environmental attitudes on pro-environmental behavior. Across all decisions, the predicted probability to act pro-environmentally for people high in pro-environmental attitudes and high self-control (i.e. 1 SD above the mean) is 41.00%, compared to 29.66% for people low in self-control (i.e. 1 SD below the mean). Thus, across all decisions, being high versus low in self-control increases the probability to act on one's pro-environmental attitudes by 38.23 percent. As shown in Fig. 4B, pro-environmental attitudes are no longer predictive of pro-environmental decision-making when self-control is low (i.e. below −0.86, which approximately corresponds to 1SD below the mean (−0.77)).

Table 3 displays the corresponding regression results, showing a significant interaction effect of environmental attitudes and trait self-control on the probability to make a pro-environmental choice, both without ($p < .001$, Model 1) and with control variables ($p < .001$, Model 2). From the set of control variables, only political views were significantly associated with the dependent variable, meaning that more liberal participants showed more pro-environmental behavior.

3.4. Exploratory analysis

As outlined in the introduction, people need self-control when long-term valued goals are in conflict with temporarily more gratifying goals (Duckworth et al., 2016). Translating this into the present context, the moderating effect of trait self-control may be more pronounced in situations where the conflict between personal financial benefits and

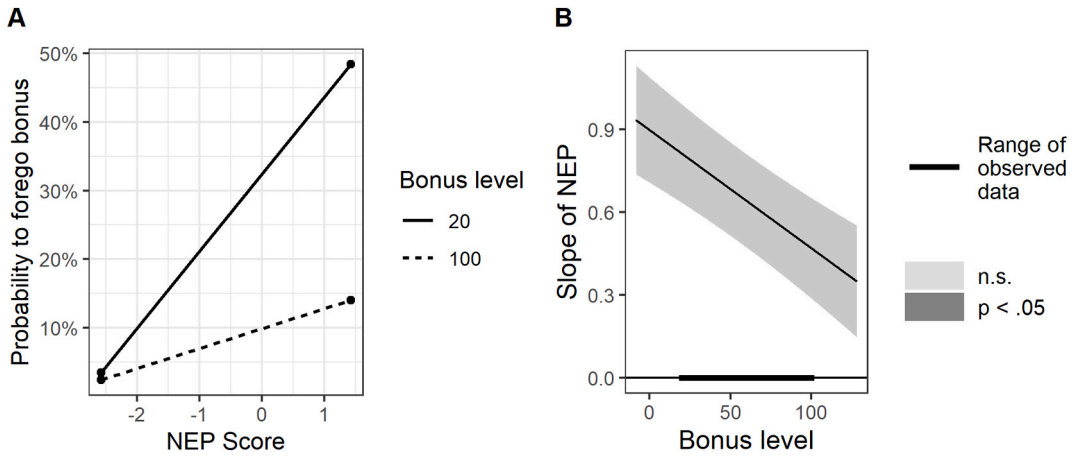

Fig. 2. Interaction effect of pro-environmental attitudes (NEP) and bonus level on the predicted probability to forego a bonus
Note. Moderation effect of bonus level on the relationship between environmental attitudes and pro-environmental behavior (A) with Johnson-Neyman confidence bands (B). Estimated probabilities stem from a collapsed analysis of 4 sessions based on 37,867 decisions from 1,531 participants. We obtained the estimates from a mixed-effects logistic regression accounting for repeated decision-making of individuals and between-session heterogeneity. Higher NEP-R Scores reflect higher levels of pro-environmental attitudes. NEP is entered as mean-centered variable.

Table 2
Interaction effect of pro-environmental attitudes (NEP) x carbon emission from a mixed-effects logistic regression with foregoing the bonus opportunity as dependent variable.

Predictors	Model 1			Model 2		
	Odds Ratios	*CI*	*p*	*Odds Ratios*	*CI*	*p*
(Intercept)	0.06	0.04–0.09	**<.001**	0.05	0.02–0.11	**<.001**
NEP	1.35	1.11–1.65	**.003**	1.18	0.94–1.47	.149
Carbon	1.13	1.13–1.14	**<.001**	1.13	1.13–1.14	**<.001**
NEP * Carbon	1.06	1.06–1.07	**<.001**	1.06	1.06–1.07	**<.001**
Age				1.00	0.99–1.01	.664
Gender (1 if female)				1.07	0.81–1.41	.653
Highest Education				1.04	0.94–1.15	.438
Political views				0.88	0.81–0.96	**.002**
Income (dummy coded)	NO			YES		
Session (dummy coded)	YES			YES		
Random Effects						
σ^2	3.29			3.29		
τ_{00}	5.87 $_{participants}$			5.65 $_{participants}$		
ICC	0.64			0.63		
	1,531 $_{participants}$			1,447 $_{participants}$		
Observations	37,867			35,786		
Marginal R^2/ Conditional R^2	0.200/0.713			0.209/0.709		

Note. The dependent variable refers to whether participants made a pro-environmental choice (coded "1") or not (coded "0"). To facilitate interpretation, NEP is entered as a mean-centered variable. Number of subjects vary due to missing values.

long-term pro-environmental concerns is particularly high. In the carbon emission task, people may perceive low levels of goal conflicts through various means. Trials that have particularly high relative environmental harms for relative low levels of financial bonuses may elicit little conflict as it is clear that Option B is preferred. On the other hand, in trials with particularly high financial bonuses and low environmental harms, Option A may be strongly preferred and elicit low levels of decision conflict. Conversely, high conflict decisions may be characterized by relatively similar levels of bonus heights and emission amounts. For example, if both bonus and emission levels are high, people may be conflicted between their two goals, reaping financial benefits and protecting the environment. Importantly, such decision conflicts may not merely be shaped exogenously, but also depend on a person's individual factors, such as her environmental attitudes or her financial needs. As an illustration, a person who does not care about the environment will never experience a decision conflict in the carbon emission task and always reap the financial benefit.

Nevertheless, the exogenous variations provided in the task's trials may unravel decision-making patterns that suggest that the moderating effect of trait self-control may be particularly pronounced in "high-conflict" trials. To provide a first insight into how the effect of self-control on the relationship between pro-environmental attitudes and behavior may differ depending on how emission and bonus levels are paired, we plotted the interaction effects between pro-environmental attitudes and self-control on pro-environmental behavior for each trial separately (see Table S2 and see Fig. S2). Fig. S2 shows that although people with high levels of self-control (+1SD) display a positive correlation between their pro-environmental attitudes and behavior across all trials, the moderating effect of self-control differs between trials. Future research may thus further explore how self-control can act as a resource for overcoming the environmental attitude-behavior gap under different levels of goal-conflict.

4. Discussion

In a controlled behavioral experiment including a diverse sample, we examined how pro-environmental attitudes and trait self-control are associated with pro-environmental decision-making using the carbon emission task (Berger & Wyss, 2021), which varies personal opportunity costs and environmental benefits. First, we found that pro-environmental attitudes are more strongly linked to pro-environmental behavior when the (financial) opportunity cost to do so is low. This finding is in line with previous theorizing and empirical research on the low-cost hypothesis, according to which environmental attitudes influence pro-environmental behavior mainly in "in situations and under conditions connected with low costs and little inconvenience for individual actors" (Diekmann & Preisendörfer, 2003, p. 443). However, previous empirical research has so far been mute about whether – in addition to personal costs – the magnitude of a decision's environmental consequences has an effect on how pro-environmental attitudes translate into corresponding behavior, as theorized by Steg and Vlek (2009). To this end, we found that when the environmental

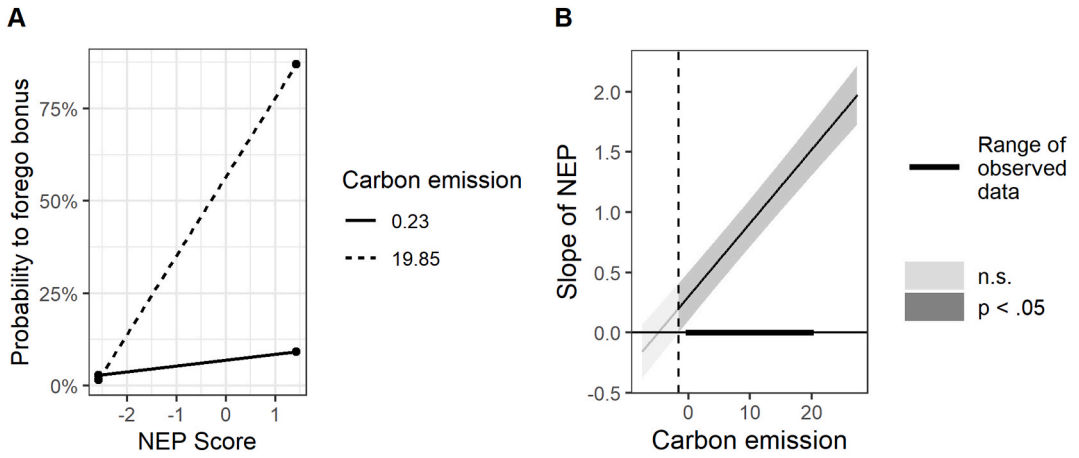

Fig. 3. Interaction effect of pro-environmental attitudes and carbon emission on the predicted probability to forego a bonus
Note. Moderation effect of carbon emission levels on the relationship between environmental attitudes and pro-environmental behavior (A) with Johnson-Neyman confidence bands (B). Estimated probabilities stem from a collapsed analysis of 4 sessions based on 37,867 decisions from 1,531 participants. We obtained the estimates from a mixed-effects logistic regression accounting for repeated decision-making of individuals and between-session heterogeneity. Higher NEP-R Scores reflect higher levels of pro-environmental attitudes. NEP is entered as mean-centered variable.

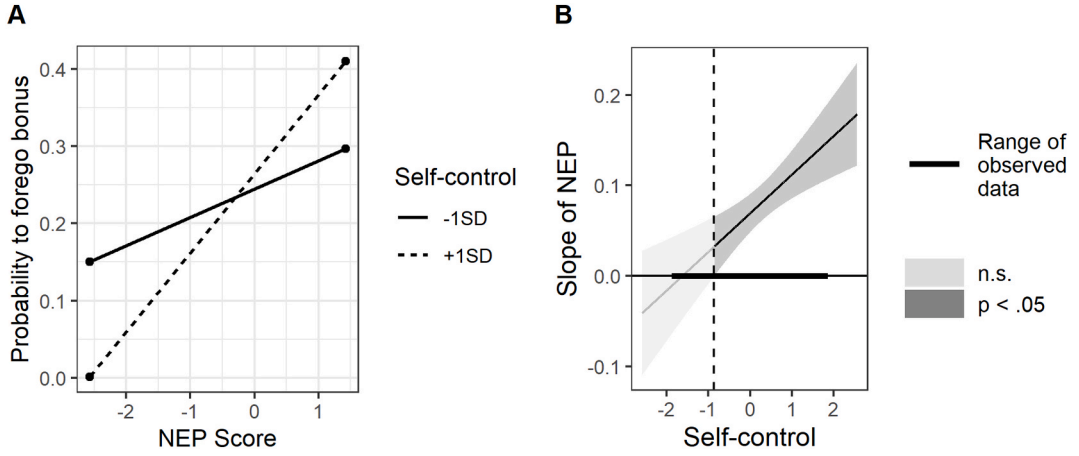

Fig. 4. Interaction effect of pro-environmental attitudes (NEP) and self-control capacity on the predicted probability to forego a bonus. *Note.* Moderation effect of trait self-control on the relationship between environmental attitudes and pro-environmental behavior (A) with Johnson-Neyman confidence bands (B). Estimated probabilities stem from a collapsed analysis of 4 sessions based on the mean decision to forego the bonus from 1,529 participants. We obtained the estimates from a linear regression accounting for between-session heterogeneity. Higher NEP Scores reflect higher levels of pro-environmental attitudes. NEP and self-control are entered as mean-centered variables.

Table 3
Interaction effect of pro-environmental attitudes (NEP) x self-control from linear regressions with the mean of pro-environmental decisions as dependent variable.

Predictors	Model 1			Model 2		
	Estimates	*CI*	*p*	*Estimates*	*CI*	*p*
(Intercept)	0.25	0.21–0.29	**<.001**	0.23	0.14–0.32	**<.001**
NEP	0.07	0.05–0.09	**<.001**	0.05	0.03–0.07	**<.001**
Self-control	0.01	−0.01–0.03	.167	0.01	−0.01–0.03	.454
NEP * Self-control	0.04	0.02–0.07	**<.001**	0.05	0.02–0.07	**<.001**
Age				0.00	−0.00–0.00	.549
Gender (1 if female)				0.02	−0.01–0.05	.205
Highest Education				0.00	−0.01–0.01	.844
Political views				−0.02	−0.02–−0.01	**<.001**
Income (dummy coded)	NO			YES		
Session (dummy coded)	YES			YES		
Observations	1,529			1,446		
R^2/R^2 adjusted	0.221/0.217			0.242/0.231		

Note. To facilitate interpretation, NEP and self-control are entered as mean-centered variables. Number of subjects vary due to missing values.

harm rises, people are more likely to behave in line with their pro-environmental attitudes.

In addition to these situational factors, we predicted and found that the relationship between pro-environmental attitudes and behavior is stronger for participants high in trait self-control. These findings support recent theorizing and first empirical research on the role of self-regulation in pro-environmental decision-making (Baumgartner et al., 2019; Langenbach et al., 2020; Nielsen, 2017), and our exploratory analysis further suggests that the effect of self-control may be dependent on the relationship between the amount of opportunity costs and environmental harm. Taken together, these results indicate that people generally take into account the costs and benefits associated with their environmental choices, but, even if their willingness to protect the environment is high, they may lack the self-control capacity needed to successfully keep their attitudes and behavior aligned.

Future research could be initiated based on our exploratory finding that the moderating effect of trait self-control may be more pronounced in decisions, in which people experience high levels of conflict between their short-term and long-term goals. As this conflict is likely to depend on both exogenous and endogenous factors, future research may benefit from the inclusion of process-tracing methods. For example, measuring response-times (Evans et al., 2015) or tracking attention via eye or mouse movements (Franco-Watkins et al., 2019) could provide fruitful insights in to the decision-making mechanisms and the conflicts people experience when trading-off environmental and financial goods.

On a broader level, our results provide empirical support for existing policies and may open up various opportunities for novel policy-instruments. For example, our results highlighting the behavioral dependence on bonus levels and emissions may provide a psychological rationale for carbon taxation (Baranzini et al., 2000; Harring & Jagers, 2013). Carbon taxes can make unsustainable short-term behaviors financially less rewarding and thereby, in psychological terms, decrease the goal-conflict between short-term financial and long-term pro--environmental options. Likewise, “behavioral policy” elements such as defaults (Ebeling & Lotz, 2015) aim to decrease the “cognitive” cost of pro-environmental decision-making as they spare people from having to invest the effort of actively switching to a more sustainable choice (Samuelson & Zeckhauser, 1988). Although defaults have been linked to serve as an external self-control device (Duckworth et al., 2018), future research could elucidate the exact conditions under which defaults and other behavioral nudges contribute to the closure of the environmental attitude-behavior gap.

Additionally, our results provide further support for carbon labelling, as individuals are likely to underestimate the carbon emissions associated with their consumption choices (Camilleri, 2019). Importantly, a continued work on shaping pro-environmental attitudes and combating climate-sceptic campaigns remains necessary, as they can directly increase pro-environmental behavior in contexts characterized by low perceived personal costs and high environmental benefits, and indirectly by, for example, supporting policies that involve environmental taxes or related regulations (Harring et al., 2017; Harring & Jagers, 2013). To sum up, our research provides additional support for previous calls (e.g., Steg, 2016; Steg & Vlek, 2009) for a more integrative behavioral scientific view taking into account the motivational, dispositional, and structural factors and complexity of processes underlying environmental sustainability in an effort to mitigate the adverse effects of climate change.

Credit statement

Annika M. Wyss: Conceptualization, Methodology, Analysis, Writing - Original Draft, Writing - Review & Editing. **Daria Knoch:** Writing - Review & Editing. **Sebastian Berger:** Conceptualization, Methodology, Analysis, Writing - Original Draft, Writing - Review & Editing, Funding acquisition.

Declaration of competing interest

Authors declare no competing interests.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jenvp.2021.101748.

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