



# Pride and guilt as mediators in the relationship between connection to nature and pro-environmental intention

Laura Pasca<sup>1</sup>

Received: 19 January 2022 / Accepted: 30 October 2022 / Published online: 15 November 2022  
© The Author(s) 2022

## Abstract

As a result of the environmental issues, different variables have been studied in relation to environmental concern and pro-environmental behavior. Among these are the connection to nature and emotions. In a first study ( $n=95$ ), pride and guilt were found to be emotions which can be explained by the perceived environmental impact of those rather than the behavior itself. In a second study, it was observed that pride and guilt play a mediating role in the relationship between connectedness to nature and pro-environmental behavioral intention ( $n=244$ ). On the other hand, in the relationship between love for nature and behavioral intention, pride, but not guilt, played a mediating role ( $n=253$ ). Thus, the importance of fostering both pride and guilt in attaining higher levels of environmentally conscious behavior, as well as of considering people's perceptions of the impact of their behaviors on the environment, is highlighted.

**Keywords** Connectedness to nature · Love for nature · Pride · Guilt · Pro-environmental behavior

## 1 Introduction

In recent years, research about environmental issues has grown substantially because of the emergence of new problems. Within this field, several variables have been attributed to concern and to pro-environmental behavior. Among them, great importance has been given to the study of human connections to nature, as well as to the emotions associated with environmental issues. The literature has shown how both the former (e.g., Mackay and Schmitt 2019) and the latter (e.g., Zelenski and Desrochers 2021) are related to pro-environmental behavior. However, the role of both together in pro-environmental behavior is not as extensively studied, despite the existence of multiple studies relating connectedness to nature and emotions (e.g., Mayer et al. 2009).

---

✉ Laura Pasca  
laura.pasca@ucm.es

<sup>1</sup> Facultad de Psicología, University Complutense of Madrid, Campus de Somosaguas, 28223 Madrid, Spain

## 1.1 Emotions and pro-environmental behavior

A growing line of interest in the study of pro-environmental behavior is that of emotions (Carrus et al. 2008; Coelho et al. 2017). For example, in a study about ecological packaging, it was found that both positive and negative emotions are related to pro-environmental behavioral intention (Koenig-Lewis et al. 2014). In addition, Bissing-Olson et al. (2013) found that higher levels of positive affect among a company's employees led to higher levels of pro-environmental behavior in those workers with less positive pro-environmental attitudes.

Within the scope of emotions lie the self-conscious emotions of pride and guilt. That is, they are emotions that arise due to an evaluation of the self, of one's own behavior (Tracy and Robins 2007). In this way, it is suggested that if people consider that they have acted correctly, they will feel proud, but if, on the other hand, they evaluate their behavior as negative, they will feel guilty. In attempting to relate such emotions to pro-environmental behavior, Bissing-Olson et al. (2016) found that feelings of pride lead to higher levels of pro-environmental behavior in those who had reported others performing such behaviors. However, these were not related to guilt. For their part, Liang et al. (2019) found that pride explains pro-environmental behavioral intention as well as avoidance of environmentally harmful behaviors. Furthermore, their results showed that guilt explains, although to a lesser extent, pro-environmental behavioral intention, being unrelated to intention to avoid harmful behaviors. In other studies, guilt has been related to both pro-environmental behavioral intention and pro-environmental behavior (Mallett 2012; Rees et al. 2015; Tam 2019). In this way, Adams et al. (2020) found that guilt exerts a mediating role between the feedback provided to participants about their environmental impact and pro-environmental behavior, with no statistically significant results having been found for pride. Similarly, Hurst and Sintov (2022) found that guilt is a motivator of pro-environmental behavior, whereas pride depends on the context in which the emotion is elicited. Also considering guilt as a mediating variable, Ferguson and Branscombe (2010) noted that feelings of collective guilt about pollutant emissions mediate between beliefs about climate change and behavioral intention.

Due to the contradictions found regarding the relationship of pride and guilt to pro-environmental behavior, Shipley and van Riper (2022) conducted a meta-analysis in which they differentiated between "experienced" and "anticipated" emotions. Experienced emotions, as stated by Baumeister et al. (2007), are those that provide feedback about our behavior, promoting cognitive analysis. On the other hand, they state that anticipated emotions are those that people expect to feel if they perform a certain behavior. The results of Shipley and van Riper's (2022) meta-analysis showed, firstly, that both pride and guilt correlate with pro-environmental behavior, with the relationship of the first one being stronger. Second, they showed that, when it comes to anticipated emotions, in correlational studies, pride is more strongly related to pro-environmental behavior than guilt. In contrast, in experimental studies, they found no differences between pride and guilt in terms of anticipated emotions. On the other hand, when it involves experienced emotions, guilt, but not pride, is related to pro-environmental behavior (they did not include correlational studies analyzing experienced emotions). In this vein, Hurst and Sintov (2022) compared anticipated and experienced pride and guilt in motivating pro-environmental behavior. However, they found no evidence that the effect of pride and guilt on pro-environmental behavior is based on whether these are anticipated or experienced.

As pointed out by Adams et al. (2020), most of the studies use paradigms based on anticipated emotions—which is supported by the absence of correlational studies based on experienced emotions included in the Shipley and van Riper (2022) meta-analysis. Considering that pro-environmental/harmful behaviors encompass people’s daily behaviors, it is considered important to study how people feel when performing them. In different research (e.g. Adams et al. 2020; Hurst and Sintov 2022), to study these emotions, researchers have provided feedback about whether a certain behavior performed is “good” or “bad.” However, in day-to-day life, people do not receive such feedback, so it is up to them to evaluate their behavior. Then, if a person evaluates his behavior as positive, he/she will feel pride, and if he/she evaluates it as negative, he/she will feel guilt.

Nevertheless, people demonstrate difficulties and biases in estimating the extent to which performing a behavior has negative consequences for the environment (Holmgren et al. 2018; Hoogendoorn et al. 2019; Kusch and Fiebelkorn 2019), so feelings of pride and guilt will be produced to a greater or lesser extent based on a subjective consideration of how “good” or “bad” what has been done is. That is, if a person relativizes his behavior, considers that it is not so bad, then it is to be expected that he/she will not experience feelings of guilt. As Grinstein et al. (2018) have shown, people commit more mistakes when estimating the amount of CO<sub>2</sub> emitted when performing a behavior than when estimating other quantities such as calories or distances. Therefore, it is possible that it is not the behaviors (both pro-environmental and harmful) themselves that lead to pride or guilt, but rather the perception of their consequences, i.e., their impact on the environment (Hypothesis 1).

## 1.2 Subjective connections between people and nature

On the other hand, the literature shows how people’s connection to nature is related to pro-environmental behavior, in such a way that people who are more connected to nature show more environmentally friendly behaviors (e.g., Richardson et al. 2020), which is the reason why great efforts are made to foster it (Church 2018; Restall and Conrad 2015).

The mechanism of connection between humans and nature has been conceptualized by various different authors, who refers to it as “emotional affinity toward nature” (Kals et al. 1999) “Inclusion of Nature in Self” (Schultz 2001), “connectedness to nature” (Mayer and Frantz 2004), “connectivity with nature” (Dutcher et al. 2007), “nature relatedness” (Nisbet et al. 2009), and “love and care for nature” (Perkins 2010), among others. However, despite the different concepts and measures, these are all expressions of the same construct—a subjective connection to nature (Capaldi et al. 2014; Tam 2013), focusing in some cases on the cognitive dimension and in others on the affective dimension (Amérigo et al. 2012). These relations between nature and human beings refer not only to how nature forms part of an individual’s identity, but also to the way in which individuals perceive themselves to be a part of nature (Dutcher et al. 2007).

A widely used concept when relating people’s connections to nature to pro-environmental behavior is that of connectedness to nature (Barbaro and Pickett 2016; Gkargavouzi et al. 2021; Navarro et al. 2020; Rosa et al. 2018), proposed by Mayer and Frantz (2004). This concept, these authors point out, is based on Leopold’s idea that human beings have a need to feel part of the natural world, which means that they see themselves as equal members of the natural community, conceiving a relationship of kinship with it. It consists of a bidirectional relationship in which people see themselves as belonging to the natural world just as much as the natural world belongs to them and

consider the well-being of both to be interdependent. Although this concept was originally proposed as an emotional connection, later, Perrin and Benassi (2009) conducted a study using the same data gathered by the original authors and found that connectedness to nature, or at least the way in which it is measured, exhibits characteristics of a cognitive character.

On the other hand, pro-environmental behavior has also been related to emotional connections to nature (Dong et al. 2020; Perkins 2010; Wu and Zhu 2021). These have been defined as a deep love for nature, an acknowledgement of its intrinsic value (Perkins 2010). It can be understood as a benevolent attachment toward nature, whose presence brings pleasant feelings to the people involved (Pasca et al. 2020). This emotional component of connectedness has nature as the object of emotion. That is, while emotions such as pride or guilt are self-conscious, i.e., emotions that arise from self-evaluation—being the self the object of the emotion (Tangney et al. 2007)—the emotional relationship with nature refers to the valuation of nature.

The study of these relationships, both cognitive and emotional, has recently been reported in the meta-analysis conducted by Whitburn et al. (2020). In this report, the authors analyzed several studies that linked different conceptualizations of connection to nature to pro-environmental behavior as a whole. These concepts have been found to be strongly related; however, as Tam (2013) illustrates, when comparing the correlations of each measure with the different criterion variables traditionally related to connectedness, such as personality variables, well-being, or pro-environmental behavior, it is observed that their magnitudes are not the same. In other words, it could be said that all these concepts have a shared element that comprises the nature-human being relationship, but that they also have a specific element that causes them to correlate differently with other related variables.

### 1.3 Connections to nature and feelings of pride and guilt

People's connections to nature, as described above, lead to higher levels of concern and pro-environmental behavior, as well as feelings of pride and guilt. Considering both factors, it is proposed that people more cognitively and emotionally linked to nature will feel higher levels of both pride and guilt regarding their behavior in relation to the environment, as the environment is more relevant to these people. In relation to this argument, Bösehans et al. (2020) found that guilt exerts a mediating role in the relationship between biospheric values and pro-environmental behavior (specifically, with the choice of train as a means of travel instead of airplane). In other research, Tam (2019) concluded that anthropomorphism of nature—related in turn to connectedness to nature (Tam et al. 2013)—leads to greater pro-environmental behavioral intention through the mediating effect of guilt. On the other hand, the study conducted by Barthel et al. (2018) illustrated how children, after an experience in nature to enhance connectedness, reported higher levels of pride. However, no studies have been found that analyze the mediating effect of both emotions on the relationship between connection to nature and pro-environmental behavioral intention.

Based on this approach, Hypothesis 2 has been established: Feelings of both pride and guilt exert a mediating role in the relationship between subjective connection to nature and pro-environmental behavioral intention.

In addition, it is hypothesized (Hypothesis 3) that different types of human-nature connections will relate differently—based on these emotions—to pro-environmental behavior.

## 2 Overview

In order to test the hypotheses, two studies were carried out. In the first study, the aim was to analyze the variables that explain pride and guilt, hypothesizing that it is not the behavior itself that leads to these emotions, but the perception of the consequences of the behavior (Hypothesis 1).

The second study analyzed the mediating role of both pride and guilt in the relationship between connection to nature and pro-environmental behavioral intention (Hypothesis 2). This role was analyzed in two different samples: one in which connection was measured at the cognitive level and the other at the affective level, with the aim of observing whether there are differences in the role of both emotions (Hypothesis 3).

## 3 Study 1

In order to analyze the variables that explain people's feelings of pride or guilt, a first study was carried out.

### 3.1 Method

#### 3.1.1 Participants

G\*power software (Faul et al. 2007) was used to calculate the necessary sample size to carry out the analyses. Based on the mean effect size found for the psychosocial phenomena ( $d=0.43$ ; Richard et al. 2003), to obtain a power of 0.85 using a linear multiple regression with two predictors, at least 89 participants were necessary. So the sample was made up of 95 people from the general population. The mean age was 35.24 (SD = 14.51), and 64.2% were women.

#### 3.1.2 Instrument and procedure

An online questionnaire was developed. It was distributed with the collaboration of 10 psychology degree students, who sent the link of the questionnaire to people of different age ranges. The database and questionnaire can be found at <https://osf.io/fd234/>.

The questionnaire first included a Likert-type scale of eight items referring to different pro-environmental behaviors, such as recycling or saving water, used in previous research (Pasca 2022). With the instruction "First, a set of pro-environmental behaviors will be presented. To what extent do you perform each of them?" the participants had to respond to each of the items on a six-point continuum, from "never" to "always." This was followed by a ten-point Likert-type item, adapted from Pasca and Poggio (2021), on the perception of the negative environmental impact of one's own pro-environmental behaviors ("Taking into account the frequency with which you perform these behaviors, to what extent do you consider that you have a negative impact on the environment when you perform them?"). This was followed by a nine-point Likert-type item asking about the degree of pride felt in performing the above pro-environmental behaviors ("To what extent do you feel proud of the previous behaviors you have performed?").

On the second page of the questionnaire, similarly to the first, a list of behaviors was initially shown. Here, eight environmentally harmful behaviors were presented (Pasca 2022).

**Table 1** Linear regression analysis of perceived impact and performance of pro-environmental behaviors on pride

		<i>B</i>	<i>t</i>	95% CI	<i>R</i> <sup>2</sup>	$\Delta R^2$
Model 1	Environmental impact	−.567*	−6.632	(−0.702, −0.379)	.321	
Model 2	Environmental impact	−.479*	−5.462	(−0.623, −0.291)	.378	.057
	Performance of pro-environmental behaviors	.254*	2.892	(−0.203, −1.095)		

\**p* < .001**Table 2** Linear regression analysis of perceived impact and performance of harmful behaviors on guilt

		<i>B</i>	<i>t</i>	95% CI	<i>R</i> <sup>2</sup>	$\Delta R^2$
Model 1	Environmental impact	.586*	6.972	(0.404, 0.726)	.343	
Model 2	Environmental impact	.543*	5.965	(0.349, 0.698)	.354	.011
	Performance of harmful behaviors	.111	1.216	(−0.234, 0.974)		

\**p* < .001

With the instruction “Now a series of environmentally harmful behaviors will be presented. To what extent do you perform each of them?” participants had to respond to each of the items by placing themselves on a six-point continuum, from “never” to “always.” Then, an item on the perception of the negative environmental impact of one’s own behaviors was included, this time referring to the previous harmful behaviors. Next, a nine-point Likert-type item was included, asking about the degree of guilt felt for engaging in these behaviors (“To what extent do you feel guilty of the previous behaviors you have performed?”).

### 3.2 Results

First, after calculating the mean scores for each behavioral scale (pro-environmental or environmentally harmful), a linear regression analysis was carried out in which two variables—pro-environmental behavior and environmental impact attributed to pro-environmental behaviors—were analyzed as explanatory variables of pride. First, the perceived impact was included in the model, and then, both perceived impact and behavioral performance were included in a second model. The raw correlations between variables can be found at <https://osf.io/fd234/> (Table S1). The results (Table 1) show that when the environmental impact of pro-environmental behaviors and the performance of pro-environmental behaviors are included in the equation, the model explains 37.8% of the variance of feelings of pride. This model implies a change in *R*<sup>2</sup> of 0.057 with respect to the model that only includes the environmental impact of pro-environmental behaviors.

Secondly, a linear regression analysis was carried out in which two variables—harmful behavior and environmental impact attributed to harmful behaviors—were analyzed as explanatory variables of guilt. The results (Table 2) show that the environmental impact of harmful behaviors explains 34.3% of the variance of guilt feelings. Thus, Hypotheses 1 would appear to be supported.

### 3.3 Discussion

The results of the present study show that feelings of pride and guilt are explained by different variables. On the one hand, people feel pride when performing pro-environmental behaviors and not due to the fact that they do not perform harmful behaviors. However, the percentage of variance explained by these behaviors is much lower than that explained by the environmental impact attributed to them.

On the other hand, feelings of guilt have been explained exclusively by people's perception of the environmental impact of their behaviors on the environment. Therefore, it seems that it is not the behaviors themselves that produce feelings of pride or guilt, but the perception of their consequences.

## 4 Study 2

After conducting the first study in which it was observed that feelings of pride and guilt could be explained by the perception of the consequences of behaviors—rather than the behavior itself—a second study was carried out. Considering these results, this paper aims to study the role of pride and guilt in the relationship between connection to nature and pro-environmental behavior. Considering Hypothesis 3, the analyses will be carried out on two different samples. On the one hand, cognitive connections will be taken into account. On the other, emotional connections will be considered.

### 4.1 Method

#### 4.1.1 Participants

A total of 497 people participated in the study, recruited from the general Spanish population. They were divided into two samples. The first ( $n = 244$ ) had a mean age of 35.96 ( $SD = 15.48$ ), and 66.8% were women. The second ( $n = 253$ ) had a mean age of 35.67 ( $SD = 15.20$ ), and 56.9% were women. The sample size was estimated with G\*Power software (Faul et al. 2007) and following the recommendations of Fritz and MacKinnon (2007) for an effect size of 0.43 (linear multiple regression with three predictors), so that the analyses could be performed with a statistical power above 0.80.

#### 4.1.2 Instrument and procedure

Two versions of an online questionnaire were developed. These were distributed with the help of 43 Psychology Degree students, who sent the link incidentally to people of different age ranges. Participants were randomly assigned to one of the two questionnaires. Approximately half of the participants responded to one of the versions and the other half to the other. The databases and questionnaire can be found at <https://osf.io/fd234/>.

The two versions of the questionnaire differed only in the measure of connection to nature, in order to make salient only one of the two types of link with nature. In the first version of the questionnaire, the Connectedness to Nature Scale, in its seven-item version

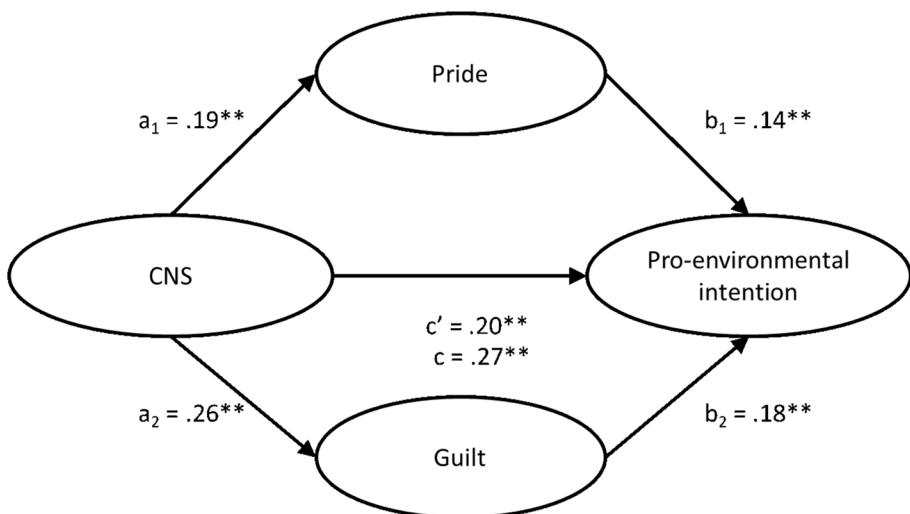
(CNS-7; Pasca et al. 2017), was included. In the second version, the Love for Nature Scale (LNS; Pasca et al. 2020) was included instead.

On the second page of the questionnaire, a measure of pride and guilt was included in both versions. To this end, Bissing-Olson et al. (2016) adaptation of the State Shame and Guilt Scale was used. These authors used three terms to measure pride (proud, content, and pleased with myself) and three terms to measure guilt (guilty, remorseful, and regretful). This measure included the instruction “Considering your level of impact on the environment, to what extent do you feel...?” followed by the choice of six adjectives on a seven-point Likert-type scale.

Finally, a pro-environmental behavioral intention scale was included, which asked to what extent they were willing to carry out each of the pro-environmental behaviors. The behaviors included were extracted from the work of Wynes and Nicholas (2017), in which they proposed a list of recommended actions to mitigate climate change based on their degree of effectiveness. This measure is composed of nine items with a six-point Likert-type response format, with participants having to respond to each item from “not at all” to “completely.”

## 4.2 Results

Two mediation analyses were conducted to find out whether feelings of pride and guilt exert a mediating effect between connection to nature (cognitive (CNS) and emotional (LNS)) and pro-environmental behavioral intention. For this purpose, the SPSS macro Process was used (Hayes 2013) with 5000 bootstrap samples to estimate 95% bias-corrected confidence intervals (BC 95% CI). A BC 95% CI that does not include zero provides evidence of a significant indirect effect (MacKinnon et al. 2000; Preacher and Hayes 2008). The raw correlations between variables can be found at <https://osf.io/fd234/> (Table S2). The first mediating analyses (Fig. 1) revealed significant indirect



**Fig. 1** Mediation model, showing the effect of CNS on pro-environmental intention through pride and guilt. \* $p < .05$ ; \*\* $p < .01$



effects of CNS on pro-environmental intention through pride ( $B = .03$ ;  $SD = 0.01$ ; BC 95% CI = 0.01 to 0.06) and guilt ( $B = .05$ ;  $SD = 0.02$ ; BC 95% CI = 0.02 to 0.08); therefore, the data support Hypothesis 2.

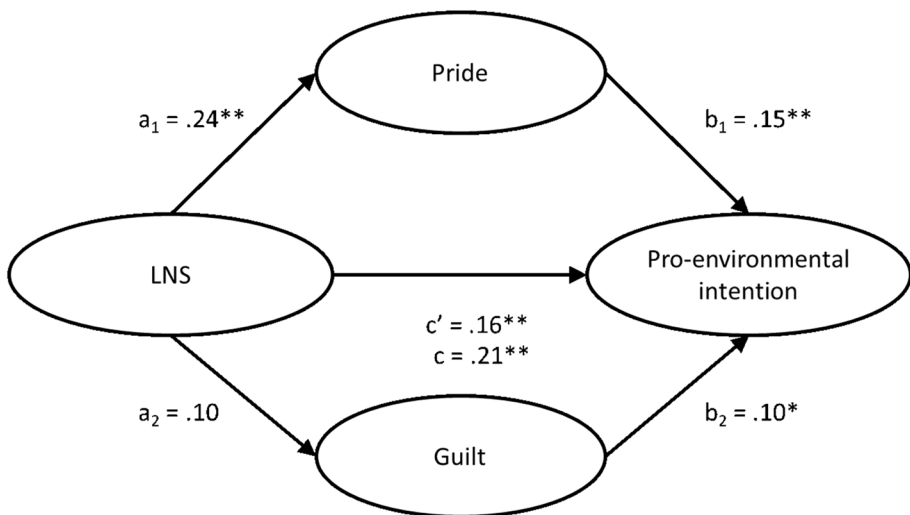
The second mediating analyses (Fig. 2) revealed significant indirect effects of LNS on pro-environmental intention through pride ( $B = .04$ ;  $SD = 0.01$ ; BC 95% CI = 0.01 to 0.07), while the effect of guilt was not statistically significant ( $B = .05$ ;  $SD = 0.01$ ; BC 95% CI =  $-0.00$  to 0.02). Thus, the data only partially supports Hypothesis 2, in turn supporting Hypothesis 3 about differences between cognitive and emotional connections.

On the other hand, the Pearson correlation between the two mediating variables was calculated, showing an inverse correlation in both the first sample ( $r = -.21$ ;  $p < .001$ ) and the second ( $r = -.19$ ;  $p < .01$ ).

### 4.3 Discussion

The present study analyzed the mediating role of pride and guilt in the relationship between—cognitive and emotional—connection to nature and pro-environmental behavioral intention. The results of the mediation analyses show, firstly, that both pride and guilt exert a mediating effect between connectedness to nature (cognitive measure) and the intention to carry out pro-environmental behaviors. When the analysis was performed with an affective measure, however, it was observed that pride does exert a mediating effect, although this effect was not present in the case of guilt.

On the other hand, the two mediating variables are inversely related. That is, people who feel more proud of their levels of environmental impact feel less guilty and vice versa. Taking into account the result of the first mediational analysis, in which was observed that both variables are positively related to connectedness, it can be concluded



**Fig. 2** Mediation model, showing the effect of LNS on pro-environmental intention through pride and guilt. \* $p < .05$ ; \*\* $p < .01$

that the levels of pride and guilt are reported differentially. That is, there are people who feel proud to a greater extent and others who feel guilty to a greater extent, and both feelings lead to greater pro-environmental behavioral intention. However, the correlation between both variables is small, so this result should be taken with caution.

## 5 General discussion

In this research, the relationship between human connections to nature and pro-environmental behavioral intention has been studied in a differentiated way, based on whether the former is of a cognitive or emotional nature. To this end, the mediating role of emotions, specifically pride and guilt, has been analyzed.

First of all, the results of the first study have shown that the degree to which people perceive that their behavior has a negative impact on the environment explains whether they feel proud or guilty about it. In particular, people feel proud when they engage in pro-environmental behaviors, but to a greater extent when they perceive that these behaviors also have a low impact on the environment. Thus, people will feel guilty when they perceive that their behaviors which are not pro-environmental also have a highly negative impact on the environment.

Furthermore, the results of the second study have shown that connection to nature is related to pro-environmental behavioral intention, as had already been highlighted in the literature (e.g., Otto and Pensini 2017). Hence, the importance of fostering human-nature connections is again highlighted, as it would entail people recognizing the intrinsic value of nature rather than promoting pro-environmental behavior through external rewards (Ives et al. 2018), the effect of which has been observed not to persist in the long term (Van Der Linden 2015). In addition, this work has differentiated between two different forms of connection. As mentioned above, Tam (2013) conducted a review about the different concepts and measures of these connections, finding that, although they all have a common base, these have particularities that were observed from correlations with different variables. Mediation analyses have shown that pride and guilt exert a mediating role in the relationship when the connection to nature is cognitive in nature. However, when the connection is emotional, pride exerts a mediating role but not guilt. The cognitive component of connectedness refers to a consideration, i.e., rationally, a person may consider that he/she is part of nature, that the human being is part of it. Therefore, based on this belief, it is expected that feelings of pride for taking care of it, and guilt for damaging it, will appear. On the other hand, the emotional component refers to the affection for nature. This link has been related to environmental identity (Olivos and Aragonés 2011), which implies a sense of connection with the natural environment based on emotional attachment (Clayton 2003). In this regard, works such as that of Swim and Bloodhart (2015) have shown an effect of guilt on pro-environmental behavior in people not considered environmentalists, while guilt did not exert such an effect in those environmentalists, but group pride did. Meanwhile, Tam (2019) argues that in order to produce feelings of guilt, the “cognitive template of harm” must operate. This idea is based on the theory of dyadic morality (e.g., Schein and Gray 2018), which posits that in order to make a judgment, the object of harm is categorized, thus requiring the operation of cognitive, rather than emotional, processes. Therefore, a possible explanation for the results of the present research is that the fact of making the emotional link salient is not sufficient for guilt to appear, but it is possible when the link is made salient at the cognitive level, which allows people to value their inclusion

as part of nature. On the other hand, as pointed out by Böhm (2003), guilt is an emotion characterized by individual contributions. According to “Study 1,” guilt is explained by the perception of the environmental impact of one’s own behaviors, i.e., the individual contribution to environmental degradation. In the aforementioned work, the author concluded that guilt is an emotion that is not very intense in relation to environmental consequences, due to the fact that little personal responsibility is assumed. In this vein, Pasca and Poggio (2021) found that, despite the fact that people consider their environmental impact to be higher than is acceptable, the environmental impact of others is even higher. In other words, responsibility is placed on others to a greater extent than on the individual.

Therefore, taking the results of both studies into consideration, people who consider that they are connected to nature to a greater extent will feel more proud if they perceive that their environmental impact is low and more guilty if they perceive that their impact on the environment is high. Thus, by experiencing one emotion or the other, they will have a greater intent to act in a pro-environmental way. On the other hand, when people feel emotionally connected to nature, they will feel more proud if they perceive that their impact on the environment is low. The results of Shipley and van Riper’s (2022) meta-analysis showed, first, that both pride and guilt correlate with pro-environmental behavior, being stronger the relationship with pride. Considering the results of the present research, it can be argued in the same direction, since pride has turned out to be a mediating mechanism between both types of connectedness and pro-environmental behavior, whereas guilt has only been a mediating mechanism between cognitive connectedness and pro-environmental behavior. However, in contrast to the meta-analysis cited above, in this case, experienced emotions were studied.

Therefore, the present work shows that pro-environmental behavioral intention can be fostered by both feelings of pride and guilt, and the intervention could be adapted to two kinds of people: those who feel proud of the low environmental impact of their pro-environmental actions and those who feel guilty about the high environmental impact of their environmentally damaging actions.

## 5.1 Limitations and future research

To finish, it is necessary to point out some of the limitations of the study. Firstly, the sample was intended to be as heterogeneous as possible in order to provide an adequate representation of the population. However, using an online format meant that people who are not familiar with new technologies, such as the elderly, have been largely excluded. On the other hand, it presents the limitation of a convenience sample, as the questionnaire was administered to people close to the collaborators. However, the fact that it was distributed by 43 different people makes it possible to achieve a certain degree of heterogeneity. These 43 people are students of the psychology degree, not related to pro-environmental activities. Therefore, it is expected that there is no specific tendency in any of the variables of interest.

Second, given the correlational nature of the study, it is not possible to know the effect on pro-environmental behavioral intention of making salient the emotions of pride and guilt felt when they carried out the behaviors. Thus, it would be interesting to know whether, over time after the behavior, this emotion-intention relationship is attenuated, for example, as suggested by the results of the first study, by relativizing the consequences of the behavior, or by other barriers to pro-environmental behavior identified by the literature (e.g., Gifford 2011).

On the other hand, pro-environmental behavioral intention has been measured in a global way, including behaviors such as recycling, saving water, and reducing meat consumption. However, a recent study by Martin et al. (2020) has shown that connection to nature is differently related to household pro-environmental behavior and nature conservation pro-environmental behavior. Such differentiation would be interesting to take into account in future research and could provide more information on the relationship between connectedness and pro-environmental behavior.

**Supplementary Information** The online version contains supplementary material available at <https://doi.org/10.1007/s10584-022-03458-0>.

**Funding** Open Access funding provided thanks to the CRUE-CSIC agreement with Springer Nature.

**Data availability** The datasets generated during and/or analyzed during the current study are available in the OSF repository, <https://osf.io/fd234/>.

## Declarations

**Ethical approval** I consciously assure that the manuscript was conducted following the ethical principles of psychologists and code of conduct laid out by the American Psychological Association (APA). The study also complied with Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April on the protection of personal data. The research was approved by the deontological commission of the Faculty of Psychology of the Complutense University of Madrid (ref. 2020/21–031).

**Conflict of interest** The author declares no competing interests.

**Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

## References

- Adams I, Hurst K, Sintov ND (2020) Experienced guilt, but not pride, mediates the effect of feedback on pro-environmental behavior. *J Environ Psychol* 71:101476. <https://doi.org/10.1016/j.jenvp.2020.101476>
- Amérigo M, Aragonés JI, García JA (2012) Explorando las dimensiones de la preocupación ambiental. *Una Propuesta Integradora Psicología* 3(3):353–365. <https://doi.org/10.1174/217119712802845723>
- Barbaro N, Pickett SM (2016) Mindfully green: examining the effect of connectedness to nature on the relationship between mindfulness and engagement in pro-environmental behavior. *Pers Individ Differ* 93:137–142. <https://doi.org/10.1016/j.paid.2015.05.026>
- Barthel S, Belton S, Giusti M, Raymond CM (2018) Fostering children's connection to nature through authentic situations: the case of saving salamanders at school. *Front Psychol* 9:928. <https://doi.org/10.3389/fpsyg.2018.00928>
- Baumeister RF, Vohs KD, DeWall CN, Zhang L (2007) How emotion shapes behavior: feedback, anticipation, and reflection, rather than direct causation. *Pers Soc Psychol Rev* 11(2):167–203. <https://doi.org/10.1177/1088868307301033>
- Bissing-Olson MJ, Fielding KS, Iyer A (2016) Experiences of pride, not guilt, predict pro-environmental behavior when pro-environmental descriptive norms are more positive. *J Environ Psychol* 45:145–153. <https://doi.org/10.1016/j.jenvp.2016.01.001>

- Bissing-Olson MJ, Iyer A, Fielding KS, Zacher H (2013) Relationships between daily affect and pro-environmental behavior at work: the moderating role of pro-environmental attitude. *J Organ Behav* 34:156–175. <https://doi.org/10.1002/job>
- Böhm G (2003) Emotional reactions to environmental risks: consequentialist versus ethical evaluation. *J Environ Psychol* 23(2):199–212. [https://doi.org/10.1016/S0272-4944\(02\)00114-7](https://doi.org/10.1016/S0272-4944(02)00114-7)
- Bösehans G, Bolderdijk JW, Wan J (2020) Pay more, fly more? Examining the potential guilt-reducing and flight-encouraging effect of an integrated carbon offset. *J Environ Psychol* 71:101469. <https://doi.org/10.1016/j.jenvp.2020.101469>
- Capaldi CA, Dopko RL, Zelenski JM (2014) The relationship between nature connectedness and happiness: a meta-analysis. *Front Psychol* 5:976. <https://doi.org/10.3389/fpsyg.2014.00976>
- Carrus G, Passafium P, Bonnes M (2008) Emotions, habits and rational choices in ecological behaviours: the case of recycling and use of public transportation. *J Environ Psychol* 28(1):51–62. <https://doi.org/10.1016/j.jenvp.2007.09.003>
- Church SP (2018) From street trees to natural areas: retrofitting cities for human connectedness to nature. *J Environ Plan Manag* 61:878–903. <https://doi.org/10.1080/09640568.2018.1428182>
- Clayton S (2003) Environmental identity: a conceptual and an operational definition. In: Clayton S, Opatow S (ed), *Identity and the Natural Environment*. MA: MIT PRESS, Cambridge, pp. 45–65
- Coelho F, Pereira MC, Cruz L, Simões P, Barata E (2017) Affect and the adoption of pro-environmental behaviour: a structural model. *J Environ Psychol* 54:127–138. <https://doi.org/10.1016/j.jenvp.2017.10.008>
- Dong X, Liu S, Li H, Yang Z, Liang S, Deng N (2020) Love of nature as a mediator between connectedness to nature and sustainable consumption behavior. *J Clean Prod* 242:118451. <https://doi.org/10.1016/j.jclepro.2019.118451>
- Dutcher D, Finley J, Luloff AE, Johnson J (2007) Connectivity with nature as a measure of environmental values. *Environ Behav* 39(4):474–493. <https://doi.org/10.3197/096327108X303882>
- Faul F, Erdfelder E, Lang AG, Buchner A (2007) G\*Power 3: a flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behav Res Methods* 39(2):175–191
- Ferguson MA, Branscombe NR (2010) Collective guilt mediates the effect of beliefs about global warming on willingness to engage in mitigation behavior. *J Environ Psychol* 30(2):135–142. <https://doi.org/10.1016/j.jenvp.2009.11.010>
- Fritz MS, MacKinnon DP (2007) Required sample size to detect the mediated effect. *Psychol Sci* 18(3):233–239. <https://doi.org/10.1111/j.1467-9280.2007.01882.x>
- Gifford R (2011) The dragons of inaction: psychological barriers that limit climate change mitigation and adaptation. *Am Psychol* 66(4):290–302. <https://doi.org/10.1037/a0023566>
- Gkargkavouzi A, Paraskevopoulos S, Matsiori S (2021) Assessing the structure and correlations of connectedness to nature, environmental concerns and environmental behavior in a Greek context. *Curr Psychol* 40(1):154–171. <https://doi.org/10.1007/s12144-018-9912-9>
- Grinstein A, Kodra E, Chen S, Sheldon S, Zik O (2018) Carbon innumeracy. *PLoS ONE* 13(5):1–14. <https://doi.org/10.1371/journal.pone.0196282>
- Hayes AF (2013) *Introduction to mediation, moderation, and conditional process analysis*. Guilford Press, New York
- Holmgren M, Kabanshi A, Marsh JE, Sörqvist P (2018) When A+B < A: cognitive bias in experts' judgment of environmental impact. *Front Psychol* 9:823. <https://doi.org/10.3389/fpsyg.2018.00823>
- Hoogendoorn G, Sütterlin B, Siegrist M (2019) When good intentions go bad: the biased perception of the environmental impact of a behavior due to reliance on an actor's behavioral intention. *J Environ Psychol* 64:65–77. <https://doi.org/10.1016/j.jenvp.2019.05.003>
- Hurst KF, Sintov ND (2022) Guilt consistently motivates pro-environmental outcomes while pride depends on context. *J Environ Psychol* 80:101776. <https://doi.org/10.1016/j.jenvp.2022.101776>
- Ives CD, Abson DJ, von Wehrden H, Dorninger C, Klaniecki K, Fischer J (2018) Reconnecting with nature for sustainability. *Sustain Sci* 13:1389–1397. <https://doi.org/10.1007/s11625-018-0542-9>
- Kals E, Schumacher D, Montada L (1999) Emotional affinity toward nature as a motivational basis to protect nature. *Environ Behav* 31(2):178–202. <https://doi.org/10.1177/00139169921972056>
- Koenig-Lewis N, Palmer A, Dermody J, Urbye A (2014) Consumers' evaluations of ecological packaging - rational and emotional approaches. *J Environ Psychol* 37:94–105. <https://doi.org/10.1016/j.jenvp.2013.11.009>
- Kusch S, Fiebelkorn F (2019) Environmental impact judgments of meat, vegetarian, and insect burgers: unifying the negative footprint illusion and quantity insensitivity. *Food Qual Prefer* 78:103731. <https://doi.org/10.1016/j.foodqual.2019.103731>
- Liang D, Hou C, Jo MS, Sarigöllü E (2019) Pollution avoidance and green purchase: the role of moral emotions. *J Clean Prod* 210:1301–1310. <https://doi.org/10.1016/j.jclepro.2018.11.103>

- Mackay CM, Schmitt MT (2019) Do people who feel connected to nature do more to protect it? A Meta-Analysis. *J Environ Psychol* 65:101323. <https://doi.org/10.1016/j.jenvp.2019.101323>
- MacKinnon DP, Krull JL, Lockwood CM (2000) Equivalence of the mediation, confounding and suppression effect. *Prev Sci* 1:173–181. <https://doi.org/10.1023/A:1026595011371>
- Mallett RK (2012) Eco-Guilt Motivates Eco-Friendly Behavior. *Ecopsychology* 4(3):223–231. <https://doi.org/10.1089/eco.2012.0031>
- Martin L, White MP, Hunt A, Richardson M, Pahl S, Burt J (2020) Nature contact, nature connectedness and associations with health, wellbeing and pro-environmental behaviours. *J Environ Psychol* 68:101389. <https://doi.org/10.1016/j.jenvp.2020.101389>
- Mayer FS, Frantz CM (2004) The connectedness to nature scale: a measure of individuals' feeling in community with nature. *J Environ Psychol* 24(4):503–515. <https://doi.org/10.1016/j.jenvp.2004.10.001>
- Mayer FS, Frantz CM, Bruehlman-Senecal DK (2009) Why is nature beneficial? The role of connectedness to nature. *Environ Behav* 41(5):607–643. <https://doi.org/10.1177/0013916508319745>
- Navarro O, Tapia-Fonllem C, Fraijo-Sing B, Roussiau N, Ortiz-Valdez A, Guillard M, Fleury-Bahi G (2020) Connectedness to nature and its relationship with spirituality, wellbeing and sustainable behaviour. *Psychology* 11(1):37–48. <https://doi.org/10.1080/21711976.2019.1643662>
- Nisbet EK, Zelenski JM, Murphy SA (2009) The Nature Relatedness Scale: linking individuals' connection with nature to environmental concern and behavior. *Environ Behav* 41(5):715–740. <https://doi.org/10.1177/0013916506295574>
- Olivos P, Aragonés JI (2011) Psychometric properties of the environmental identity scale (EID). *Psychology* 2(1):65–74. <https://doi.org/10.1174/217119711794394653>
- Otto S, Pensini P (2017) Nature-based environmental education of children: environmental knowledge and connectedness to nature, together, are related to ecological behaviour. *Glob Environ Change* 47:88–94. <https://doi.org/10.1016/j.gloenvcha.2017.09.009>
- Pasca L (2022) Estimating one's own environmental impact: others, acceptability, and off-setting. *Psychology* 13(2):139–158. <https://doi.org/10.1080/21711976.2022.2034289>
- Pasca L, Aragonés JI, Coello MT (2017) An analysis of the connectedness to nature scale based on item response theory. *Front Psychol* 8:1330. <https://doi.org/10.3389/fpsyg.2017.01330>
- Pasca L, Paniagua D, Aragonés JI (2020) Psychometric properties of the measure of love for nature. *Span J Psychol* 23:E47. <https://doi.org/10.1017/SJP.2020.49>
- Pasca L, Poggio L (2021) Biased perception of the environmental impact of everyday behaviors. *J Soc Psychol*. <https://doi.org/10.1080/00224545.2021.2000354>
- Perkins HE (2010) Measuring love and care for nature. *J Environ Psychol* 30(4):455–463. <https://doi.org/10.1016/j.jenvp.2010.05.004>
- Perrin JL, Benassi VA (2009) The connectedness to nature scale : a measure of emotional connection to nature? *J Environ Psychol* 29(4):434–440. <https://doi.org/10.1016/j.jenvp.2009.03.003>
- Preacher KJ, Hayes AF (2008) Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behav Res Methods* 40:879–891. <https://doi.org/10.3758/BRM.40.3.879>
- Rees JH, Klug S, Bamberg S (2015) Guilty conscience: motivating pro-environmental behavior by inducing negative moral emotions. *Clim Change* 130(3):439–452. <https://doi.org/10.1007/s10584-014-1278-x>
- Restall B, Conrad E (2015) A literature review of connectedness to nature and its potential for environmental management environmental management. *J Environ Manage* 159:264–278. <https://doi.org/10.1016/j.jenvman.2015.05.022>
- Richard FD, Bond CF Jr, Stokes-Zoota JJ (2003) One hundred years of social psychology quantitatively described. *Rev Gen Psycho* 7(4):331–363. <https://doi.org/10.1037/1089-2680.7.4.331>
- Richardson M, Passmore H, Barbett L, Lumber R, Thomas R, Hunt A (2020) The green care code: how nature connectedness and simple activities help explain pro-nature coservation behaviours. *People Nat* 2(3):821–839. <https://doi.org/10.1002/pan3.10117>
- Rosa CD, Profice CC, Collado S (2018) Nature experiences and adults' self-reported pro-environmental behaviors: the role of connectedness to nature and childhood nature experiences. *Front Psychol* 9:1055. <https://doi.org/10.3389/fpsyg.2018.01055>
- Schein C, Gray K (2018) The theory of dyadic morality: reinventing moral judgment by redefining harm. *Pers Soc Psychol Rev* 22(1):32–70. <https://doi.org/10.1177/1088868317698288>
- Schultz W (2001) The structure of environmental concern: concern for self, other people, and the biosphere. *J Environ Psychol* 21(4):327–339. <https://doi.org/10.1006/jenvp.2001.0227>
- Shipley NJ, van Riper CJ (2022) Pride and guilt predict pro-environmental behavior: a meta-analysis of correlational and experimental evidence. *J Environ Psychol* 79:101753. <https://doi.org/10.1016/j.jenvp.2021.101753>

- Swim JK, Bloodhart B (2015) Portraying the perils to polar bears: the role of empathic and objective perspective-taking toward animals in climate change communication. *Environ Commun* 9(4):446–468. <https://doi.org/10.1080/17524032.2014.987304>
- Tam KP (2013) Concepts and measures related to connection to nature: similarities and differences. *J Environ Psychol* 34:64–78. <https://doi.org/10.1016/j.jenvp.2013.01.004>
- Tam KP (2019) Anthropomorphism of nature, environmental guilt, and pro-environmental behavior. *Sustainability* 11(19). <https://doi.org/10.3390/su11195430>
- Tam KP, Lee SL, Chao MM (2013) Saving Mr. Nature: anthropomorphism enhances connectedness to and protectiveness toward nature. *J Exp Soc Psychol* 49(3):514–521. <https://doi.org/10.1016/j.jesp.2013.02.001>
- Tangney JP, Stuewig J, Mashek DJ (2007) Moral emotions and moral behavior. *Annu Rev Psychol* 58:345–372. <https://doi.org/10.1146/annurev.psych.56.091103.070145>
- Tracy JL, Robins RW (2007) Self-conscious emotions: where self and emotion meet. In: Sedikides C, Spencer SJ (eds) *The self*. Psychology Press, New York, pp 187–209
- Van Der Linden S (2015) Intrinsic motivation and pro-environmental behaviour. *Nat Clim Chang* 5(7):612–613. <https://doi.org/10.1038/nclimate2669>
- Whitburn J, Linklater W, Abrahamse W (2020) Meta-analysis of human connection to nature and pro-environmental behavior. *Conserv Biol* 34(1):180–193. <https://doi.org/10.1111/cobi.13381>
- Wu L, Zhu Y (2021) How love of nature promotes green consumer behaviors: the mediating role of biospheric values, ecological worldview, and personal norms. *PsyCh J*. <https://doi.org/10.1002/pchj.430>
- Wynes S, Nicholas KA (2017) The climate mitigation gap: education and government recommendations miss the most effective individual actions. *Environ Res Lett* 12(7):074024. <https://doi.org/10.1088/1748-9326/aab210>
- Zelenski JM, Desrochers JE (2021) Can positive and self-transcendent emotions promote pro-environmental behavior? *Curr Opin Psychol* 42:31–35. <https://doi.org/10.1016/j.copsy.2021.02.009>

**Publisher's note** Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.