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ORIGINAL RESEARCH

The Role of Social Norms and Personal Costs on Pro-Environmental Behavior: The Mediating Role of Personal Norms

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Background: Pro-environmental behavior necessitates individuals to make personal sacrifices, such as spending more money on environmentally-friendly products to benefit the environment. Realistically, individuals may not be willing to engage in pro-environmental behavior based self-interest. The increase in personal pro-environmental behavior has become an urgent issue in the field of environmental psychology.

Purpose: The present study adopted green consumption paradigm to explore the internal mechanisms of pro-environmental behavior at different personal costs, the role of social and personal norms on pro-environmental behavior, which can promote individual pro-environmental behavior.

Methods: In our experiment, participants first were instructed to read texts unrelated and related to social norms in sequence. Participants subsequently completed the product choice task, which involved making choices between buying green (eco-friendly) products or cheaper (self-interested) common products, a method to measure pro-environment behavior. Finally, the participants completed the personal norms scale and social norms check.

Results: The findings of present study indicated that pro-environmental behavior decreased as personal costs increased. However, social norms effectively promoted individuals' pro-environmental behavior, and personal norms played a mediating role at high personal costs.

Conclusion: Our findings indicate that individuals tend to choose cheaper common products that are harmful to the natural environment in self-interest. However, we discuss the implications for the use of social norms as a social marketing technique, which extends the Norm Activation Model.

Keywords: pro-environmental behavior, personal costs, social norms, personal norms

Introduction

Environmental degradation inevitably restricts the survival and development of human beings.[1] In fact, rapid economic development is always accompanied by several issues, such as climate change,[2,3] biodiversity crisis,[4,5] deforestation,[6,7] and overfishing.[8] Undoubtedly, environmental problems originate from human self-interest behaviors.[9] To mitigate the negative impact of self-interest behaviors on the natural environment, there is a growing focus on engaging in pro-environmental behavior.[1]

Pro-environmental behavior requires individuals to sacrifice financial or time costs, such as purchasing more expensive green products or garbage sorting entailing substantial time commitment.[10] Pro-environmental decision-making involves a trade-off between self-interest and environment protection.[11] Green consumption behavior is a common pro-environmental behavior in daily life, which refers to the extent to which individuals consider the impact of their behavior on the environment when purchasing products, indicating that individuals try to maximize the positive impacts of their decisions while minimizing the negative impacts.[12] Individuals would ideally buy environmentally

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friendly products (ie green products) that benefit the natural environment; however, given the high price of green products, individuals tend to choose cheaper alternatives due to self-interest.[13] To promote individual pro-environmental behavior, the present study adopted green consumption paradigm to explore the internal mechanisms of pro-environmental behavior at different personal costs.

Social norms, which refer to the beliefs that individuals hold about what the majority of other people approve of doing,[14] are classified as injunctive norms (ie highlighting what others think one should do) and descriptive norms (ie highlighting what others are doing).[15] Numerous empirical studies have shown that social norms promote pro-environment behaviors.[15–19] Social norms propel the adoption of sustainable behavior, such as reusing towels by hotel guests,[20] reducing household energy consumption,[21,22] reducing plastic bag use,[23] recycling,[24] saving energy,[17,19] and garbage sorting.[16,18,25,26] Social norms urging consumers to adopt sustainable behaviors are more prevalent than ever; however, previous studies have not explored how social norms and personal costs interact with pro-environmental behavior. Therefore, the present study aimed to shed more light on the interaction between social norms and personal costs in environmental decision-making.

Although studies have shown that social norms are an important intervention for pro-environmental behavior,[27] the psychological mechanism by which social norms influence pro-environmental behavior remains unclear. There are two different explanations of social norms on pro-environmental behavior, which are still in disagreement. The original explanation suggests that personal norms moderate the influence of social norms on pro-environmental behavior.[28,29] The Elaboration Likelihood Model indicates that individuals are susceptible to the influence of peripheral information (eg social norms) when personal norms are weak. In contrast, the stronger the personal norms, the more likely it is for individuals to follow their inner moral norms when engaging environment-related behaviors.[28,29] Although supported by a small number of empirical findings, this explanation contradicts the majority of scholars who argue that personal norms are the result of the internalization of social norms.[30–32] Moreover, this explanation is also contrary to a recent survey report titled "Investigation Report on Citizens' Ecological Environment Behavior (2021)" in China, which noted that there were differences in pro-environmental behaviors and pro-environmental intentions. The results indicated that individuals have a high level of personal norms (ie perceived obligation and willingness to choose pro-environmental behavior), but are practically unwilling to engage in pro-environmental behavior. Hence, the present study also investigated the role of personal norms in the influence exerted by social norms on pro-environmental behavior in the cultural context of China.

We propose another more widespread explanation that identifies the influence of social norms on pro-environmental behavior, in which personal norms play a mediating role.[33] Personal norms are the extent to which individuals perceive that they are morally obligated to act in a particular way, which reflect what individual considers right or appropriate.[34] Personal norms can be triggered after social norms intervention.[28] For example, Nayum and Klöckner conducted a socio-psychological study based on 1793 respondents who owned cars to investigate the purchase of fuel-efficient cars by customers, and found that personal norms were influenced by social norms.[32,35] Personal norms were confirmed to mediate the relationship between social norms and pro-environmental intention/behavior.[31,32,36,37] Furthermore, the Norm Activation Theory (NAT) indicates that social norms are internalized into personal norms.[38,39] According to empirical studies and NAT, we propose that social norms are a decisive factor in pro-environment behavior, and individuals change their own intrinsic perceptions to internalize social norms. To confirm this explanation, our study investigated the psychological mechanisms of pro-environmental behavior in the Chinese cultural context, the influence of social norms on pro-environmental behavior, and the mediating role of personal norms.

In conclusion, this study adopted green consumption paradigm to explore the interaction of social norms and personal costs on pro-environmental behavior. Furthermore, given that the role of personal and social norms on pro-environmental behavior remains unclear, we discussed the mechanism to further explore the role of social and personal norms on pro-environmental behavior, which can effectively promote individual pro-environmental behavior.

Methods

Participants

We recruited 54 psychologically healthy college students (19 men; *M* age = 20.00 years, *SD* = 1.73) from Hunan Normal University by posting posters on campus, using random sampling method. As one data was missing and one participant

did not follow experimental instructions, 52 data were used for analysis. All participants were right-handed, had normal or corrected vision, and had no history of psychiatric or anxiety disorders or were currently experiencing them. Informed consent was obtained before participants started experiment, and they were informed that they had right to withdraw freely from the experiment. This study was conducted in accordance with the Declaration of Helsinki and was approved by the Ethics Committee of Hunan Normal University.

Experimental Materials

Social Norms Manipulation

The participants in the present study performed the product choice task under two conditions to manipulate the social norms.[15] In the social norms condition, participants were shown the following message: The China Consumers Association conducted a national market survey on green products purchase, and the results showed that 75% of Chinese consumers chose to buy green products. In the non-social norms control condition, participants were presented with a passage that did not contain any information related to social norms.[15] The other parameters remained consistent under both conditions.

Product Types

In our experiment, participants needed to complete a task to purchase products, which made choices between buying green or cheaper common products to measure pro-environment behavior. Based on Zhong et al, the product categories included keyrings, paper towels, notebooks, phone holders, glass cup, shampoo, umbrella, and laundry detergent. The prices of common products were determined through market research. The prices of green products were 25%, 50%, 75%, 100%, 125%, 150%, and 175% higher than common products (see Table 1).

Personal Norms Scale

We adopted a personal norms scale including four items, eg I feel it is my responsibility to protect the environment through my actions.[28,40] A series of 7-point Likert scales were used, in which 1 represented "strongly disagree" and 7 represented "strongly agree", respectively. The mean scores of the four items indicated that participants held neither an agreed nor a disagreed personal norm towards pro-environmental behavior.

Social Norms Manipulation Check

Participants were asked to answer the prevalence of purchasing green products in China on a 7-point Likert scale,[41] with 1 representing "very uncommon" and 7 representing "very common". The mean scores indicated that participants held neither a common nor an uncommon about the prevalence of purchasing green products.

Table 1 Product Attribute Specifications in the Product Choice Task

Product	Common Product Price	Green Product Price
Keyring	$0.46 (¥ 3.14)	The price was set as 25%, 50%, 75%, 100%, 125%, 150%, and 175% higher than that of corresponding common products
Paper towels	$0.75 (¥ 5.15)	
Notebook	$1.16 (¥ 8)	
Phone holders	$1.46 (¥ 10)	
Glass	$1.75 (¥ 12)	
Shampoo	$2.20 (¥ 15.12)	
Umbrella	$2.49 (¥ 17.1)	
Laundry detergent	$2.91 (¥ 20)	

Assessment of Green Consumption Behavior

The green consumption paradigm was adapted from the green travel paradigm of Lange et al and the green consumption paradigm of Jung et al.[10,11,42] After arriving at the laboratory, participants were given 55 RMB ($8.01) to purchase either green products or common products, with pro-environmental decision-making based on their own true thoughts. The amount of remaining money paid to participants was determined based on a randomly selected decision result, as a way to incentivize careful completion of the experiment. Participants were then introduced to the properties of each type of product in pairs: one was a green product and the other was a common product. Finally, the experiment was conducted.

At the beginning of the experiment, participants read texts that were unrelated to social norms and were related to social norms information in sequence, avoiding interference with the experimental condition. The product choice task was then initiated. In each product choice task, product information, such as laundry detergent, was first presented to participants. Subsequently, the prices of common and green products were presented to participants, who were asked to choose green products (press "F" key) or common products (press "J" key) with their left or right index finger, respectively. The experiment consisted of 224 trials across four blocks (two blocks for the control condition) with breaks of two minutes in between to avoid habitual decision-making due to fatigue. Each block consisted of 56 trials (8 product types ×7 prices). The entire experiment lasted for 25 min. Finally, the participants were required to answer questions about the social norms check and personal norms scale after the control and social norms conditions (See Figure 1).

Results

Manipulation Checks

The social norms manipulation check was analyzed using a paired-sample *t*-test. The results showed that the score of the control condition ($M = 3.02$, $SD = 1.09$) was significantly lower than that of the social norms condition ($M = 4.94$, $SD = 1.38$), $t(51) = 9.37$, $p < 0.001$, Cohen's $d = 1.54$, indicating that the manipulation of social norms was successful.

The internal consistency of the personal norms scale was analyzed separately for the control and social norms condition. The results showed that the Cronbach's alpha coefficient of personal norms scale in control condition was

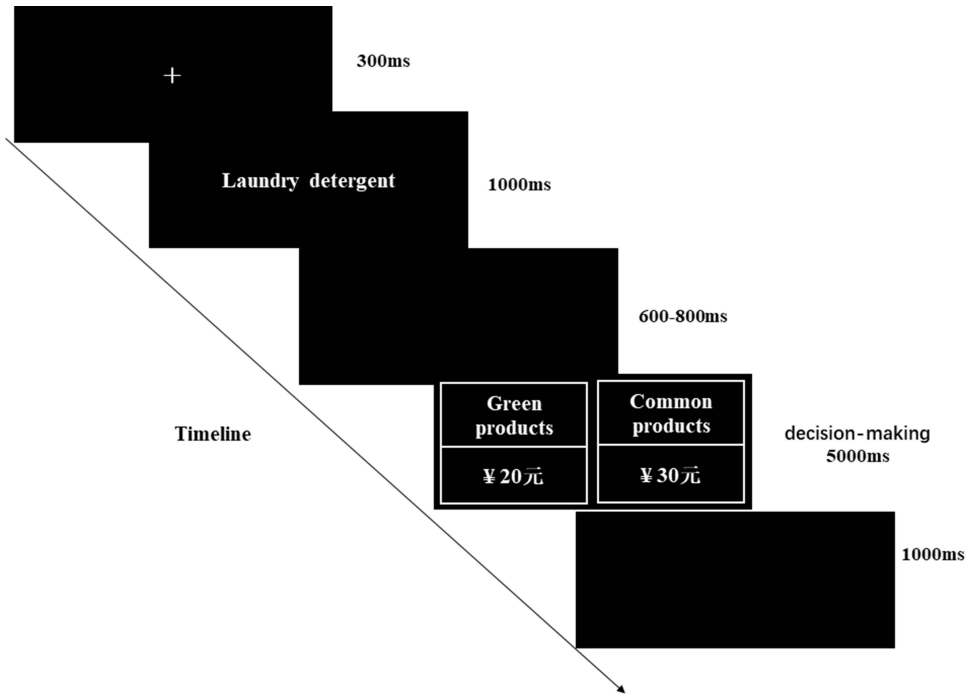

Figure 1 An illustration of a single trial in the product choice task. Each trial consisted of fixation, product name, a black screen and decision-making. After fixation appeared, the product name was presented for 1000ms. Then, the black screen was randomly displayed for 600–800ms. Subsequently, participants were instructed to make choices between buying green (eco-friendly) products or cheaper (self-interest) common products in green consumption decision-making, which was presented for 5000ms. Finally, the black screen was displayed for 1000ms.

0.80, and in social norms condition was 0.88, indicating that personal norms scale was reliable. Further analysis of personal norms can be conducted.

Personal Norms and the Proportion of Green Products Purchase

For the product choice task, Table 2 presents the descriptive statistics and planned contrasts for personal norms and the proportion of green products purchase under different conditions. The results of a paired samples t-test indicated the significant difference between the social norms condition (M = 5.47, SD = 0.13) and the control condition (M = 5.10, SD = 0.13) in terms of personal norms, t (51) = 4.75, $p < 0.001$, Cohen's d = 2.85. Additionally, a significant difference was observed between the social norms condition and the control condition in terms of the proportion of green product purchases, $t(51) = 8.05$, $p < 0.001$, Cohen's $d = 5.10$. Specifically, the proportion of green products purchase in the social norms condition (M = 0.47, SD = 0.03) was significantly higher than that in the control condition (M = 0.34, SD = 0.02), indicating that social norms significantly increased pro-environmental behavior (see Table 2 for detailed results).

Additionally, we conducted a 2 (social norms: social norms condition, non-social norms control condition) ×7 (personal costs: 25%, 50%, 75%, 100%, 125%, 150%, 175%) repeated measures analysis of variance (ANOVA) on the proportion of green products purchase. The main effect of personal costs was significant, $F(6, 306) = 113.31$, $p < 0.001$, η= 0.69; multiple comparisons showed that individuals were less inclined to purchase green products as the personal cost increased (see Table 3 for detailed results). The main effect of social norms was significant, $F(1,51) = 65.38$, $p < 0.001$, η= 0.56; the proportion of green products purchase by social norms condition (M = 0.47, SD = 0.03) was significantly higher than that of control condition (M = 0.34, SD = 0.02), indicating that social norms significantly increased pro-environmental behavior.

The interaction between social norms and personal costs was significant, $F(6300) = 3.72$, $p < 0.01$, η= 0.07. Subsequently, simple effect analysis was carried out and the main effect of social norms was found to be significant at seven different personal costs in the present study (at 25% price level: $F(1,51) = 21.20$, $p < 0.001$, η= 0.29; at 50% price level: $F(1,51) = 47.87$, $p < 0.001$, η= 0.48; at 75% price level: $F(1,51) = 49.49$, $p < 0.001$, η= 0.49; at 100% price level: $F(1,51) = 30.10$, $p < 0.001$, η= 0.37; at 125% price level: $F(1,51) = 28.56$,

Table 2 Descriptive Statistics and Results of Planned Contrasts

Condition	N	Personal Norms		The Proportion of Green Products Purchase	
		M	SD	M	SD
1. Control condition	52	5.10	0.13	0.34	0.02
2. Social norms	52	5.47	0.13	0.47	0.03
Planned contrast 1 vs 2		$t(51) = 4.75$, $p < 0.001$, Cohen's $d = 2.85$		$t(51) = 8.05$, $p < 0.001$, Cohen's $d = 5.10$	

Table 3 The Proportion of Green Products Purchase at Different Personal Costs

The Price of Green Products Higher than Common Products	M	SD
25%	76%	0.03
50%	61%	0.03
75%	46%	0.04
100%	32%	0.03
125%	29%	0.03
150%	24%	0.03
175%	19%	0.03

$p < 0.001$, η= 0.36; at 150% price level: $F(1,51) = 17.75$, $p < 0.001$, η= 0.26; at 175% price level: $F(1,51) = 11.98$, $p < 0.01$, η= 0.19), which indicated that the influence of social norms intervention on green consumption behavior was very effective at different personal costs (see Figure 2 for detailed results).

The Role of Social and Personal Norms on Green Consumption Behavior

Based on the results presented in Table 2, we found that personal norms were promoted under the influence of social norms. To test whether personal norms mediated the effect of social norms on pro-environmental behavior, we further conducted a mediation analysis (Model 4, with 5000 bootstrap samples, 95% bias-corrected intervals) using Hayes's PROCESS Macro.[43,44] Social norms were used as independent variable X (control condition = 0, social norms condition = 1), the proportion of green products purchase was dependent variable Y, and personal norms were mediating variable M. Gender and age were also controlled for to account for potential inter-individual differences in green consumption behavior. The results showed that the indirect effect did not contain 0 (effect = 0.03, SE = 0.01, 95% CI = [0.00, 0.06]), indicating that personal norms played a mediating role in the influence of social norms on green consumption behavior. In addition, after controlling the mediating variable of personal norms, the direct effect of social norms on the proportion of green products purchase was found to be significant, which the confidence interval did not contain 0(effect = 0.11, SE = 0.04, 95% CI = [0.03, 0.18]), indicating that personal norms played a partial mediating role in the influence of social norms on green consumption behavior.

As personal costs restricted the green consumption behavior, we further analyzed the influence of social norms on green consumption behavior and identified the mediating role of personal norms at seven different personal costs. The results showed boundary conditions, indicating personal norms mediated the influence of social norms on green consumption behavior only at high personal costs (ie the price of green products were 75%, 100%, 125%, 150%, and 175% higher than common products); while personal norms did not mediate the influence of social norms on pro-environment behavior at low personal costs (ie the price of green products were 25% and 50% higher than common products). Detailed results are shown in Table 4.

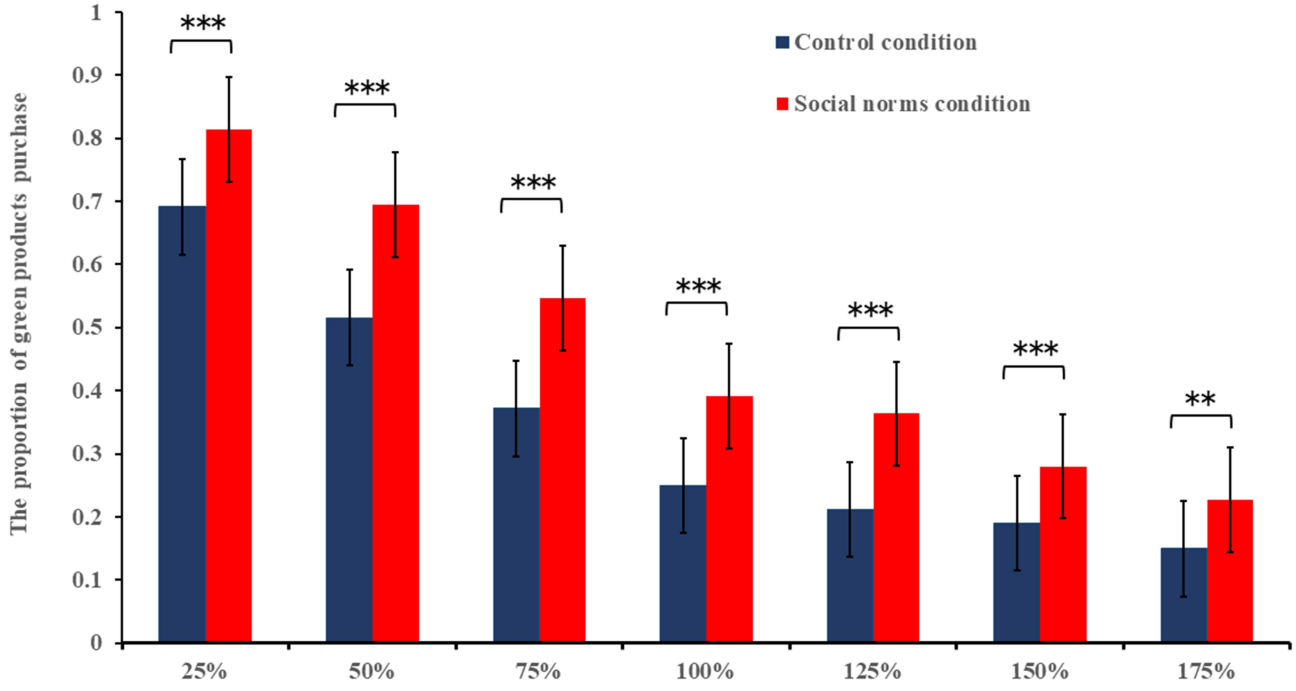

Figure 2 The proportion of green products purchase in different situations. $^{**}p < 0.01$, $^{***}p < 0.001$.

Table 4 Results of Mediating Analysis of Personal Norms at Different Personal Costs

The Price of Green Products Higher than Common Products	Type	Effect	SE	95% CI
25%	Indirect effect	0.013	0.02	[−0.01, 0.05]
	Direct effect	0.11	0.05	[0.01, 0.21]
50%	Indirect effect	0.03	0.02	[−0.00 0.07]
	Direct effect	0.15	0.05	[0.05, 0.25]
75%	Indirect effect	0.04	0.02	[0.00, 0.09]
	Direct effect	0.14	0.05	[0.03, 0.24]
100%	Indirect effect	0.03	0.02	[0.00, 0.07]
	Direct effect	0.11	0.05	[0.02, 0.21]
125%	Indirect effect	0.03	0.02	[0.00, 0.06]
	Direct effect	0.13	0.04	[0.04, 0.21]
150%	Indirect effect	0.02	0.01	[0.00, 0.05]
	Direct effect	0.07	0.04	[−0.02, 0.15]
175%	Indirect effect	0.02	0.01	[0.00, 0.05]
	Direct effect	0.06	0.04	[−0.02, 0.14]

Discussion

We adopted green consumption paradigm to explore the underlying mechanisms of pro-environmental behavior at different personal costs, and the role of social and personal norms on pro-environmental behavior. Our results showed that pro-environmental behavior decreased as personal costs increased. However, we also found that social norms effectively promoted pro-environmental behavior. Moreover, our research has shown that personal norms had boundary conditions in mediating the influence of social norms on pro-environmental behavior. The results extend the Norm Activation Model and provide management tools for promoting pro-environmental behavior.

The Role of Personal Costs on Pro-Environmental Behavior

In our study, we observed that individuals were less likely to engage in pro-environmental behavior as the personal costs of such behavior increased. This suggests that the higher the costs perceived by individuals in terms of money, the less willing they are to act in ways that benefit the environment. This finding is consistent with the previous studies. Pro-environmental decision-making involves a trade-off between self-interest and environmental protection,[11] which includes financial costs and environmental benefits associated with behavioral consequences. Empirical evidence indicated that pro-environmental behavior decreased as personal costs increased.[45] If perceived personal costs are sufficiently low, individuals with high environmental attitudes will engage in pro-environmental behaviors.[46,47] However, individuals do not engage in pro-environmental behavior at high personal costs.[48–50] Our research showed that individuals automatically weighed personal costs against environmental benefits in green consumption decision-making. When perceived opportunity costs are higher, individuals will refuse to choose green products because of intrinsic motivation to defend self-interest.

The Role of Social and Personal Norms on Pro-Environmental Behavior at Different Personal Costs

Our study showed that social norms promoted pro-environmental behavior. Previous empirical studies have indicated that descriptive social norms promote pro-environmental behaviors.[51,52] Under the influence of social norms, charitable behaviors are promoted.[19,52,53] What's more, according to the NAT, pro-environmental behavior has increased due to the intervention of social norms.[16] Therefore, our results suggest that individuals use descriptive social norms as a reference for the behavior of the majority, which helps them adjust own behavior according to normative information, promoting pro-environmental behavior even at different personal costs.

More importantly, our research discovered that personal norms mediated the influence of social norms on pro-environmental behavior only when the prices of green products were 75%, 100%, 125%, 150% and 175% higher than those of common products. The results indicated that individuals internalized social norms as personal norms, finally promoted the occurrence of pro-environmental behavior even at high personal costs, which supported the explanation that personal norms mediate the influence of social norms on pro-environmental behaviors.[31,32,37,54,55]

However, why do personal norms not mediate the effect of social norms on pro-environmental behavior at low personal costs? One study found that the green product premium that consumers could accept was 10% higher than that of common products, and consumers' green purchasing behavior would be greatly reduced when it was higher than 10%.[13,56] However, other researchers believed that the price of green products generally has a premium of approximately 33%.[13,57] In our study, we inferred that the green products premium was no more than 50% (ie at low personal costs), when personal norms would not be affected by the internalization of social norms. Thus, personal norms did not mediate the effect of social norms on pro-environmental behavior at low personal costs.

Theoretical Contribution

The findings of this study have several theoretical implications. We found that personal norms played a mediating role in the influence of social norms on pro-environmental behavior at high personal costs. In particular, our research verified that personal norms mediated the influence of social norms on pro-environmental behavior only when the prices of green products were 75%, 100%, 125%, 150%, and 175% higher than those of common products. This suggest that there are different psychological mechanisms for social norms on pro-environmental behavior at different personal costs, which makes an important contribution to the existing field.

Practical Implications

The present study sheds light on the possible interventions to promote pro-environmental behavior, particularly green consumer behavior. First, our results suggest that, with the increase in personal costs, individuals become less likely to engage in pro-environmental behavior. Therefore, reducing the personal costs associated with pro-environmental behavior or finding ways to minimize the impact of self-interest can be useful in encouraging pro-environmental behavior. Second, our results also suggest that the low-cost and easy-to-use social norms intervention is highly effective in promoting pro-environmental behavior, which can prevent environmental degradation, promote the harmonious development of human beings and nature, and contribute to forming a sense of "Community with a Shared Future for Mankind". Finally, further analysis revealed that personal norms mediated the influence of social norms on pro-environmental behavior at high personal costs. Therefore, to better internalize social norms into personal norms, social norms information can be received at high personal costs, which can better serve as a guide to internalize social norms into personal norms.

Limitations and Future Directions

The present study had several limitations. First, our study exclusively included university students, which comprises a relatively homogenous group. The use of student samples has been criticized for potentially overestimating effect sizes in one experimental studies.[58] Therefore, more caution is needed when generalizing the results for a wider population.

Furthermore, the findings are currently only applicable to the field of green consumption as the green consumption paradigm was adopted in the present study. Hence, extending our findings to other pro-environmental behaviors in everyday life should be done with caution.

Finally, green consumption paradigm has been shown to be a valid measure of the trade-off between monetary costs and environmental benefits, which is similar in many cases of pro-environmental behavior in everyday life. However, it is possible that other pro-environmental behaviors, such as those involving trade-offs between time costs and environmental donation, may have different psychological mechanisms. Therefore, further experiments are needed to investigate the underlying psychological mechanisms of other pro-environmental behaviors.

Conclusion

In conclusion, our results showed that pro-environmental behavior decreased as personal costs increased. Moreover, social norms effectively promoted pro-environmental behavior, and personal norms mediated the effects of social norms on pro-environmental behavior at high personal costs.

Ethical Approval

The Institutional Review Board of the Hunan Normal University in Hunan approved the study (2022- 497).

Author Contributions

All authors have made a significant contribution to this work, including the conception, study design, execution, acquisition of data, analysis and interpretation, as well as other areas. All authors have participated in drafting, revising, or critically reviewing the article and have given their final approval for the version to be published. All authors have also agreed on the journal to which the article had been submitted and have accepted responsibility for all aspects of the work.

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Disclosure

The authors report no conflicts of interest in this work.

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