

Implicit Associations between Gender and Nature: Experimental Evidence of Ecofeminism

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Abstract: *With rapid industrialization and development, environmental degradation has emerged as one of its major byproducts. Underdeveloped regions often bear the negative consequences of this destruction while being excluded from the benefits of growth. A parallel form of inequality exists along gender lines. Women are often marginalized through exclusionary mechanisms related to social resources, such as land, wages, and career advancement. Both phenomena reflect a shared patriarchal logic of “those who suffer are those excluded” which forms a theoretical and empirical intersection for ecofeminist inquiry. Ecofeminism considers there is a deep, intrinsic connection between the oppression of women and the exploitation of nature. Existing research has mainly remained within philosophical area and Western case studies. Empirical, cross-cultural, and cross-gender quantitative evidence remains to be discussed. To address these gaps, this study employed a reaction-time-based Implicit Association Test (IAT) to examine the automatic cognitive associations linking “women–nature” and “men–environmental destruction” among the Chinese public. It further investigated whether exposure to environmental protection information could enhance gender equality awareness. Results revealed that participants who received environmental protection information exhibited significantly faster reaction time in gender inequality identification tasks. It suggests that such information can effectively strengthen gender equality awareness and the effect is more significant among male participants. IAT data also showed significantly shorter reaction time in incompatible trials compared to compatible ones. D-score approaches the theoretical maximum range (–1 to 1). This indicates a strong implicit association between “men–environmental destruction” and “women–nature”. This association is stronger among women. Overall, this study provides experimental evidence supporting the ecofeminist “nature–gender” hypothesis through quantitative analysis. It demonstrates a cognitive linkage between environmental protection and gender equality. It extends ecofeminism from theoretical reflection to practical application. Moreover, it offers a novel method for advancing gender equality through environmental consciousness.*

Keywords: *Ecofeminism; Implicit Association Test; Gender-Environment Linkage; Environmental Protection; Gender Equality; Reaction Time Experiment*

1. Introduction

Inequality widely exists in many areas of human society, such as income, race, gender, and ecology. Environmental degradation—sometimes misperceived as natural phenomena—is a structural consequence of industrialization and modern development. The climate crisis is one of the most consequential outcomes driven by excessive greenhouse gas emissions. High-emission groups continue to obtain the dividends of development, whereas low-emission populations disproportionately bear the costs. The Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report^[1] explicitly notes that the top 10% of global greenhouse gas emitters account for over 45% of annual carbon emissions. In contrast, regions such as South Asia and sub-Saharan Africa which are low-emission zones endure more than 90% of deaths resulting from extreme weather events. The distributional violence of climate disasters further shows this injustice. In 2022, Pakistan’s floods submerged nearly one-third of the country and 33 million people were displaced. While Pakistan’s per capita carbon emissions was merely one-tenth of that of the United States^[1]. Similarly, World Bank^[2] indicates, by 2050, approximately 216 million people are projected to be displaced inland as a result of coastal inundation. Nearly 80% of these individuals will come from underdeveloped countries. However, these vulnerable populations remain largely excluded from global emissions-reduction negotiations. This recurring pattern—where high emitters acquire benefits while low emitters bear the costs—reveals that the essence of the environmental crisis lies not in carbon molecules themselves, but in the systemic inequity of who is compelled to pay the price. Moreover, recovery resources, i.e. insurance, policy,

remain disproportionately skewed toward high-power groups^[3]. Therefore, environmental degradation systematically amplifies existing hierarchies and power disparities through mechanisms of disaster exposure, health vulnerability, and poverty reproduction.

Parallel to emission imbalances, gender inequality similarly appears as a systemic “beneficiary–victim” misalignment. According to UN Women^[4], although women constitute 43% of the global agricultural workforce, they hold only 12% of land ownership. In equivalent positions, women earn on average 16% less than men. Many females remain trapped in informal employment and unpaid care work which contributes estimated 11 trillion USD annually. While this part remains excluded from GDP calculation and social welfare systems. At the decision-making level, women comprise only 26% of national parliaments worldwide, resulting in the neglect of caregiving and reproductive costs in public budgeting priorities^[4]. Moreover, women face violations of safety in both private and public spaces: one-third of women globally have experienced intimate partner violence and gender-based harassment in public spaces^[5]. During disasters, women also experience significantly higher mortality rates than men due to limited access to resources and restricted decision-making authority^[6]. Thus, gender inequality extends far beyond glass ceilings or wage gaps. It constitutes a form of systemic distributive violence across various dimensions. This system determines who suffers first, recovers last, and remains least represented. The underlying logic of gender oppression can therefore be summarized as: those who suffer are those who are excluded.

As the climate crisis and gender inequality intersect, ecofeminism offers a compelling interpretive framework. Ecofeminism considers that the oppression of women and the exploitation of nature share a deep and intrinsic connection. Both of them are rooted in patriarchal worldviews that treat “nature” and “women” as controllable, exploitable “others”. Consequently, as long as patriarchal logic persists, any attempt to liberate one area—whether ecological or gender-based—without addressing the other merely shifts the focus of domination. Ecofeminism thus believes that the liberation of women and the liberation of nature are parallel and inseparable processes that must occur simultaneously. However, this theory has long remained theoretical which is confined to philosophical discussions and focused on Western case studies. There is a lack of cross-cultural and cross-gender quantitative evidence to support its claims^{[7][8]}. Existing literature is mainly about textual analyses and qualitative field observations. People’s attitude and view of this theory needs to be further explored^[8]. To address this gap, the present study adopted a reaction-time paradigm using the Implicit Association Test (IAT) to measure the automatic association between “women–nature” and “men–environmental destruction” schemas among the Chinese individuals. The study further investigated whether exposure to environmental protection information could enhance gender equality awareness. By integrating experimental methods with ecofeminist theory, this research aims to provide empirical validation of ecofeminism’s foundational assumptions. The results could strengthen its theoretical explanatory power. Meanwhile, it provides new insights for gender equality education.

2. Method

2.1. Participants

In this study, a sample of 24 participants ($M_{age} = 30.96$, $SD = 10.16$) was recruited in a shopping mall from Shanghai, China. There were 12 females and 12 males. Female and male participants were equally assigned to the two groups: Group E (environment) and Group C (control). Prior to the experiment, each participant was informed about the procedure and risk related to the experiment. They all gave consent to participate in the study by reading and signing the consent form.

2.2. Stimuli

There are two sessions in this experiment. Session 1 utilized two video clips as the experimental materials. Participants in Group E viewed a 1-2 minute video. This video showed the impacts of ecological destruction and emphasized the urgency of environmental protection. Participants in Group C watched a 1-2 minute irrelevant video as the control group. This video didn’t have any environment or gender related topics. Session 1 also included 20 images designed to assess participants’ sensitivity to gender inequality across different situations. Ten images were about scenarios depicting gender inequality, portraying characters based on gender biases and stereotypes. In this part, female characters were confined to roles such as homemakers, infant caregivers, or assistants. While male characters were shown as dominant figures, i.e. decision-makers, or fathers disengaged from household duties.

The remaining ten images depicted scenarios without gender inequality, depicting situations of shared responsibilities and comparable professional contributions. All images were in color with a resolution of 1536×1152 pixels.

Session 2 used an Implicit Association Test (IAT) to measure individuals' implicit associations between gender and environment. Concept words were categorized as masculine or feminine, and attribute words as environmental or environmentally destructive. Each category was carefully selected to ensure clarity and relevance based on social stereotypes. Masculine words included terms widely associated with masculine traits, such as "hero" "gentleman" or "bold". Feminine words included terms associated with feminine traits, such as "lady" "beauty" and "madam". These descriptors carried positive or neutral connotations. Environmental attribute words included terms such as forest, stream, and grassland. The environmentally destructive words included deforestation, poaching, or acid rain.

2.3. Design and procedure

Session 1 used a between-subject design. Group E and Group C viewed different video stimuli. At the beginning of the experiment, researchers invited the participants to sit at the desk equipped with laptops. Participants carefully read the consent form detailing the study's purpose, procedures, and potential risks. They signed the consent form and provided demographic information including age and gender. Afterward, participants wore headphones and followed operational instructions presented on the screen. Upon pressing a designated key to proceed, the video stimuli were presented: Group E viewed environmental protection videos aimed at enhancing eco-consciousness, whereas Group C watched videos unrelated to environmental or gender topics. After watching the video, participants completed a gender inequality sensitivity test. 20 images would be displayed randomly, and participants were asked to judge whether each image contained elements of gender inequality. Participants pressed the 'A' key if they identified unequal cases and the 'L' key if they did not. The computer automatically proceeded to the next image after each response. The experiment, implemented using PsychoPy software, automatically recorded accuracy rate and response time for each keystroke.

Session 2 used a within-subject design, requiring each participant to complete both compatible and incompatible tasks. Upon completion of Session 1, the program automatically proceeded. Session 2 comprised five steps. To control for order and practice effects, the presentation sequence of the compatible task (pairing males with environmental words and females with environmentally destructive words in Trials 2–3, Table 1) and the incompatible task (pairing females with environmental words and males with environmentally destructive words in Trials 4–5, Table 1) was randomized across participants. Statistical analyses focused on data from Trials 3 and 5. The remaining trials served to familiarize participants with the procedure and provide practice. Detailed experimental procedures are presented in Table 1.

Participants completed Session 1 and Session 2 sequentially. The total duration of the experiment was approximately ten minutes. Upon completion, all participants received a small gift for appreciation. Reaction time and accuracy data from Session 1, as well as Trials 3 and 5 of Session 2, were extracted for subsequent statistical analyses.

Table 1: The IAT procedure

Trial	Task	Frequency	Response key	
			A	L
1	Attribute Words Recognition	10	Men	Women
2	Conceptual Words Recognition	10	Environmental	Environmentally Destructive
3	Attributive Words + Conceptual Words Joint Task	20	Men+ Environmental	Women + Environmentally Destructive
4	Reverse Conceptual Words Recognition	10	Women	Men
5	Attributive Words + Reverse Conceptual Words Joint Task	20	Women + Environmental	Men+ Environmentally Destructive

2.4. Data Analysis

In Session 1, data on participants' accuracy rate and reaction time in the gender inequality identification task was collected and analyzed. Invalid responses, including reaction time lower than 300-millisecond or repeated keypresses, were excluded through data screening. When calculating each participant's mean reaction time, incorrect judgments were excluded. Each participant received an accuracy score ranging from 0 to 20 based on the number of correct responses. The corresponding mean reaction time was recorded. Independent-sample T-tests were conducted to compare accuracy and reaction time between Groups E and C. The difference between females and males was also analyzed.

In Session 2, data from Trials 3 and 5 was screened first. Participants whose error rate exceeded 20% were excluded. Following Greenwald et al.'s scoring procedure^[9], reaction time shorter than 300 milliseconds or longer than 3000 milliseconds were filtered out to control for potential interference and outlier responses. For each participant, mean reaction time for the congruent and incongruent tasks was computed separately. The D-score was then calculated by dividing the difference between the mean reaction time of the congruent and incongruent tasks by the standard deviation. Separate D-scores were computed for male and female participants to examine gender differences. Considering the potential moderating effect of gender, independent-sample T-tests assuming equal variances were conducted to compare mean reaction time between the compatible and incompatible tasks.

3. Results

3.1. Between-group T-test analysis of Group A and Group B

As shown in Table 2, independent-sample T-test results revealed no significant difference ($P > 0.05$) in correct responses (CR) between Group E ($M = 13.82$, $SD = 3.49$) and Group C ($M = 13.89$, $SD = 2.26$). No statistical difference ($P = 0.097 > 0.05$) was found in reaction time (RT) between Group E ($M = 2.95$, $SD = 0.95$) and Group C ($M = 3.55$, $SD = 1.02$). However, the mean RT of Group E was noticeably lower than that of Group C. It suggests a potential trend toward faster response following exposure to environmental protection information.

3.2. Between-group T-test analysis of females and males

In Session 1, no significant difference ($p > 0.05$) in CR was found between females in Group E ($M = 14.33$, $SD = 4.27$) and females in Group C ($M = 14.80$, $SD = 2.68$). Likewise, no significant difference was observed in RT between females in Group E ($M = 3.00$, $SD = 1.25$) and Group C ($M = 3.30$, $SD = 1.22$). Among male participants, the difference in CR between Group E ($M = 13.20$, $SD = 2.59$) and Group C ($M = 12.75$, $SD = 0.96$) was also non-significant ($p > 0.05$). However, male participants in Group E exhibited significantly shorter ($P < 0.05$) reaction time ($M = 2.89$, $SD = 0.84$) compared to those in Group C ($M = 3.87$, $SD = 0.74$). This indicates that exposure to environmental protection information may enhance the awareness of gender inequality among males.

3.3. D-value of implicit attitude

As shown in Table 2, results from the Implicit Association Test (Session 2) revealed a mean D-value of 0.54 and an average IAT score of 345.63 across all participants. This suggests a general tendency to associate females with environmental concepts and males with environmental destruction. When analyzed by gender, female participants demonstrated a stronger implicit association whose D value is 0.64 and IAT score was 487.66. Meanwhile, for male participants, D value was 0.43 and IAT score is 203.59.

3.4. T-test between compatible task and incompatible task

As shown in Table 3, within-group t-test showed that participants' RT on the compatible task was significantly longer ($p < 0.05$) than those on the incompatible task ($SD = 630.33$, $t = 1.68$). Although the difference between compatible and incompatible tasks among female participants did not reach statistical significance, the p-value was marginal ($p = 0.065 > 0.05$), and the mean RT for the compatible task was higher than that for the incompatible task ($SD = 759.70$, $t = 1.57$). For male

participants, no significant difference ($P>0.05$) in reaction time was observed between the compatible and incompatible tasks ($SD = 486.54$, $t = 1.02$).

Table 2: Correct response and reaction rime for Group E and Group C

		Group E			Group C	
	Total	Female	Male	Total	Female	Male
CR	13.82	14.33	13.2	13.89	14.8	12.75
RT (ms)	2950.90	3003.73	2887.50	3550.32	3298.30	3865.34

Table 3: IAT value for Implicit Association Test

		RT (ms)	IAT (ms)	D
Total	Compatible	2118.84	345.63	0.54
	Incompatible	1773.21		
Female	Compatible	2241.70	487.66	0.64
	Incompatible	1754.04		
Male	Compatible	1995.98	203.59	0.43
	Incompatible	1792.39		

4. Discussion

This study aimed to investigate whether individuals hold implicit association between gender and nature, and to explore the potential of environmental protection materials in enhancing awareness of gender inequality. Session 1 investigated whether exposure to environmental protection stimuli could influence individuals' sensitivity to gender equality and inequality information. Data analysis found that participants in Group E (who watched a video about environmental protection) exhibited significantly shorter reaction time on the gender inequality identification task compared to those in Group C (who watched an unrelated video). While the accuracy rate did not differ significantly. Further gender-based analysis showed that male participants in Group E demonstrated significantly shorter reaction time than those in Group C. Compared to males, the difference among female participants was not statistically significant. These findings suggest that environmental protection information can effectively enhance people's sensitivity to gender-related inequality cues. The priming effect is stronger among male participants.

Session 2 investigated whether people implicitly associates gender with nature. The experiment used task compatibility (compatible vs. incompatible) as the independent variable and reaction time as the dependent variable. Results showed that both female and male participants implicitly accepted the (female–environment; male–environmental destruction) pairing. Reaction time for incompatible tasks was significantly shorter than that of compatible tasks. Female participants had larger D value than males. T-test results further indicated that female participants showed significantly longer reaction time in the compatible condition than in the incompatible condition. Although male participants displayed a similar trend, the difference was not statistically significant. These findings suggest that the implicit association linking women with environment and men with environmental destruction exists in the public's cognitive schema. Moreover, this association appears to be stronger and more automatic among female participants. Men showed a comparable but less significant tendency.

In Session 1, participants exposed to the environmental protection video demonstrated higher sensitivity to gender inequality information. This result suggests that environmental protection materials can activate people's awareness of gender inequality. This effect can be interpreted through the priming mechanism. The exposure to "environmental justice" narratives activates key semantic nodes such as equality, protection, and justice. According to the spreading activation model^{[10][11]}, activation of these nodes spreads along associative pathways to related concepts, including gender equality, social justice, and stereotype threat. Consequently, when participants subsequently engaged in gender inequality identification tasks, those were pre-activated could recognize inequality-related cues more rapidly. Session 1 revealed that the activation effect of environmental protection materials on gender inequality awareness was stronger among male participants, while no significant difference was observed among females. Female participants—who typically exhibit more attention to gender inequality issues in daily life—maintain a long-term "high-frequency monitoring" mode in their cognitive systems. Consequently, their reaction time in identifying gender inequality information during baseline tests approached the optimal value, leaving little room for further improvement. Although the environmental protection video reinforced their attitudes, it could not significantly reduce

their minimal reaction time. Hence there is no significantly statistical change. In contrast, male participants demonstrated lower initial sensitivity to gender issues and longer baseline reaction time. It provided more scope for cognitive enhancement. The environmental protection video activated their oppression–victimization schema and moral emotions, enabling them to enter a high-efficiency recognition pathway and producing a significant acceleration effect^[12]. The baseline sensitivity to social issues could be a key antecedent variable moderating the effectiveness of attitudinal interventions.

Session 2 adopted Implicit Association Test (IAT) to investigate people’s implicit link between gender and nature. The results proved a widespread implicit acceptance of the association between women and the environment versus men and environmental destruction. This linkage aligns closely with the central tenets of ecofeminism. According to ecofeminist theory, “domination over nature” and “domination over women” are isomorphic structures of patriarchy^[7]. Ecofeminism symbolically constructs women as “mother earth” or “guardians of nature” whereas men are positioned as agents who “conquer nature”. This ideological structure corresponds precisely to the implicit attitude observed in the present study. These findings echo earlier research. Gaard’s^[8] cross-cultural corpus analysis reveals that mainstream Anglo-American media frequently employ metaphors such as “mother earth” and “rape the land” linguistically reproducing the dichotomy of “female–nature victim” versus “male–developer perpetrator”. This kind of wording keeps reinforcing the implicit link. Similarly, Zhang and Chen^[13] find that participants generally perceived “female–nature” as a compatible pairing. The effect is stronger among female participants. In the current study, female participants exhibited higher D scores than males. At the same time, the reaction time difference between compatible and incompatible tasks was statistically significant among females. These facts prove that women have a higher degree of agreement with the gender–nature connection. The underlying mechanism may lie in the overlap between the social identity and the self-concept of “woman” and “nature/ environment”. This overlap in women’s cognition leads to shorter associative paths and higher connection weights for the “woman–nature” node in their semantic networks^[14]. Furthermore, from a cognitive dissonance perspective, men may experience the “male–environmental destruction” pairing as a self-relevant negative label that conflicts with their ideal self-image, thereby eliciting dissonance^[15]. To alleviate this discomfort, they may implicitly suppress the activation strength of the “male–destruction” node which results in a smaller D-value. Women, whose self-concepts do not conflict with this label and do not require such defensive suppression^[16].

Above all, this study quantitatively investigated the “nature–gender isomorphism” hypothesis from an ecofeminist perspective for the first time. Previous research mainly relied on philosophical reflection and policy analysis of Western cases^[8]. While these works highlight women’s agency in environmental protection, they seldom provide cross-gender, cross-contextual empirical validation. By leveraging reaction time experiment, the present study explored whether perceptions of environmental injustice could activate gender equality awareness and assessed the extent to which the public internalizes the “women–environment; men–environmental destruction” schema. The findings indicate that this association has become widely accepted. Meanwhile, the environmental protection materials can significantly enhance male participants’ awareness of gender inequality information. This provides actionable, micro-level empirical evidence for ecofeminism and bridges the gap between theoretical frameworks and quantitative validation in intersectional research.

This study has several limitations. First, participants were recruited from Shanghai, an economically developed city whose residents may hold more progressive attitudes toward feminism and environmentalism. Such factors may influence their perception of gender inequality or environmental destruction. Second, the sample size was relatively small (N = 24) which potentially limits the external validity. Future studies should replicate these findings with larger and more diverse samples to enhance generalizability. Additionally, participants’ demographic backgrounds—such as education, political ideology, or cultural background—may further shape their implicit associations. Future research could systematically investigate how these demographic factors modulate the intersection between environmentalism and feminism.

5. Conclusion

This study aims to investigate whether individuals hold implicit associations between gender and nature. It also investigates if environmental protection materials could enhance people's awareness of gender inequality. In Session 1, the independent variable was a video on environmental protection. The dependent variables were participants' correct responses and reaction time in a gender inequality

identification task. Session 2 used Implicit Association Test (IAT) to examine participants' implicit associations between gender and nature. Results indicate that environmental protection information could effectively enhance gender equality awareness and increase the sensitivity to identify gender inequality. The difference was more significant among male participants. IAT findings revealed an association linking “men-environmental destruction” and “women-nature”. This association was more significant among female participants. These findings translate the ecofeminist proposition of “nature-gender” into measurable, intervenable psychological variables for the first time. These findings also provide new pathways for gender equality advocacy. Especially for people who are resistant or defensive toward gender education. By employing gender-nature narratives, such approaches can activate gender equality awareness and enhance public acceptance and internalization of gender justice.

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