Perceived Pro-Environmental Message Quality and Pro-Environmental Behavior: The Mediating Role of Information Processing and Learned Helplessness Across Consumer's Environmental Knowledge Profiles

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Introduction

Environmental Messages in the Media Landscape

- In the current media landscape, **environmental messages**—particularly those related to **climate change, sustainability**, and **ecological responsibility**—are continuously produced and disseminated across various platforms (Hołyst et al., 2024).

- These messages aim to **raise awareness** and **promote pro-environmental behavior** among consumers (Pham et al., 2024).

- In the face of this **information saturation**, it becomes increasingly important to examine how the **perceived quality of environmental messages** influences consumers' understanding of the intended content—and **ultimately influences their behavioral responses** (Gokilavani et al., 2024).

Rashmi, C. P., Jain, L., & Sharma, A. (2024). Cultivating Public Perception and Policy Initiatives: Understanding the Impact of Environmental Journalism through Focus Group Discussions and Secondary Data Analysis. Current World Environment, 19(3), 1456.

Introduction

Perceived Message Quality

- How **individuals evaluate message** clarity, credibility, and manageability(Kronrod et al., 2012; Cheung et al., 2021)

- Three Key Dimensions
  - **Complexity**
    - Difficult to understand due to jargon, abstract terms, or unclear structure
    - Reduces systematic processing, especially in low-knowledge individuals(Petty & Cacioppo, 1986; O'Keefe, 2002)
  - **Bias**
    - Perceived as one-sided or manipulative
    - Triggers defensive or resistant reactions, lowers trust and persuasion(Pornpitakpan, 2004; Metzger et al., 2010)
  - **Overload**
    - Too much repetitive or alarming information
    - Leads to confusion, fatigue, emotional exhaustion(Eppler & Mengis, 2004; Gokilavani et al., 2024)

- Effects on Processing & Emotion
  - **High** complexity, bias, or overload → **cognitive engagement ↓, frustration or helplessness** ↑ (Bennett et al., 2016; Lazarus, 1991)
  - Undermines **pro-environmental intentions**(Brosch, 2021; Keller & Siegrist, 2020)

Introduction

Perceived Message Quality as a Driver of Consumers' Information Processing

- **Information processing theory** offers a valuable framework for understanding how people respond to environmental messages.
- According to the **Heuristic-Systematic Model** (Chaiken, 1980), individuals process information via two distinct pathways:
- **Heuristic processing**: intuitive, low-effort
- **Systematic processing**: deliberate, cognitively demanding

- Studies show that **perceived message quality** determines which path is taken(Vu & Chen, 2024; Mao et al., 2024; Meffert et al., 2006)
- High-quality messages → **Systematic processing**
- Low-quality messages → **Heuristic processing**

- Moreover, **the type of processing** affects **behavioral intentions**(Gao et al., 2022; Lee et al., 2024):
- **Systematic processing** → increases pro-environmental behavioral intention
- **Heuristic processing** → weakens pro-environmental behavioral intention

- **This study** explores how perceived environmental message quality influences pro-environmental behavior, **mediated by** heuristic vs. systematic information processing.

Introduction

Perceived Message Quality is also linked to Learned Helplessness

- **Learned helplessness** is a psychological state in which individuals feel **incapable of creating meaningful change**, often resulting in **behavioral inaction** (Seligman, 1972).

- This effect is especially strong when facing **overwhelming issues** like **climate change**, where the **magnitude of the problem** leads to the belief that **individual efforts are meaningless** (Salomon et al., 2017; Landry et al., 2018).

- Notably, **learned helplessness** can emerge **independently** of systematic or heuristic processing. It may bypass both cognitive pathways entirely (Lu & Huang, 2018).

Introduction

Dual Pathways of Perceived Message Processing and Behavioral Impact

- While **systematic** and **heuristic processing** represent **cognitive mechanisms** by which individuals engage with environmental messages (Huutoniemi & Willamo, 2014; Redondo Palomo et al., 2015).

- **Learned helplessness** reflects an **emotional response** that can **suppress motivation** for action (Salomon et al., 2017; Landry et al., 2018).

- This study explores how perceived message quality operates through **two distinct mechanisms**—**cognitive information processing** and **emotional disengagement**—to influence pro-environmental behavior.

- By distinguishing these two mechanisms, the study offers a **comprehensive understanding** of how environmental communication can either **empower** or **discourage** sustainable consumer actions.

Introduction

Perceived Message Quality, Processing, and Knowledge

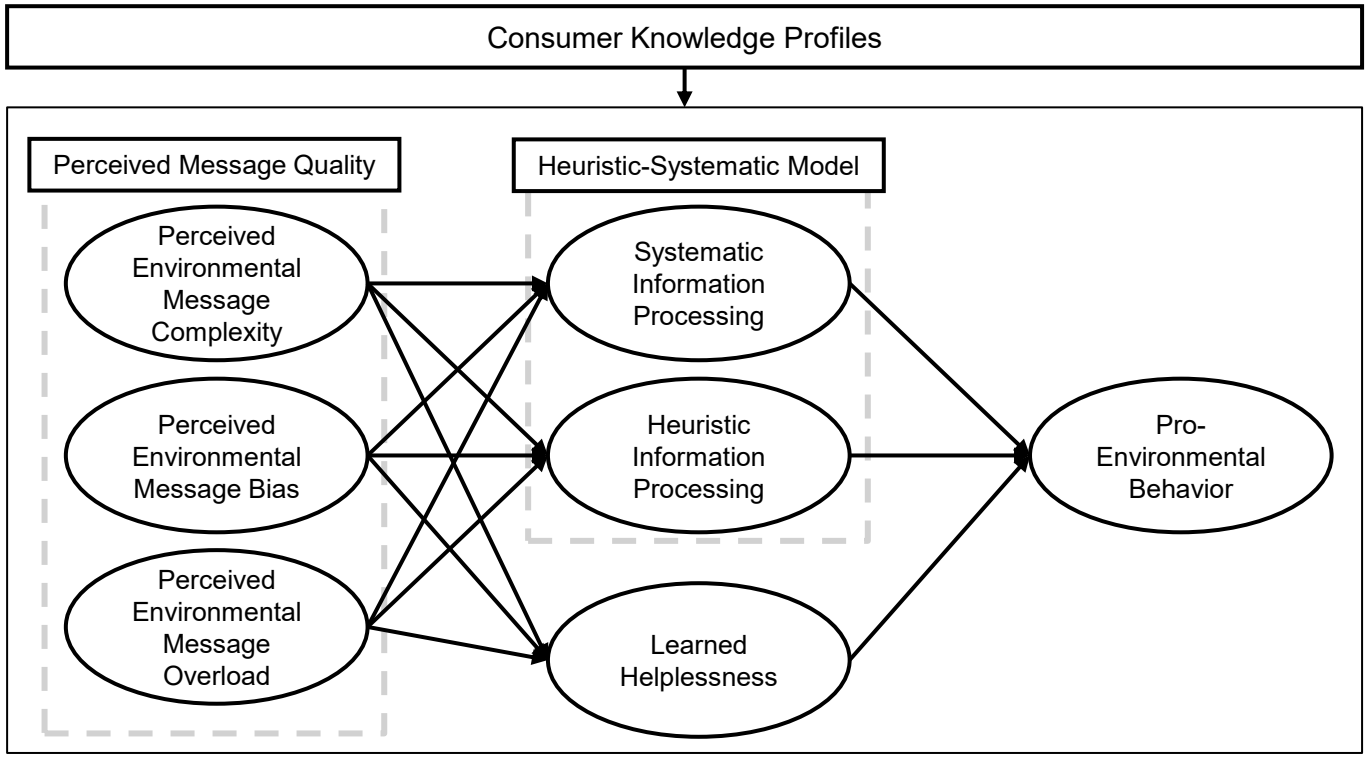
- Prior research has shown that **knowledge** is a key predictor of how individuals process information (Hajizadeh & Zali, 2016; Sharifpour et al., 2014).
- **Prior knowledge shapes how individuals react to message complexity, bias, and overload**
  - High-knowledge individuals rely on selective elaboration and tend to resist or question complex or biased content.
  - Low-knowledge individuals are more likely to feel confused, rely on surface cues, or disengage from the message.
  - Differences in knowledge levels lead to heterogeneous information processing.

- Yet, few studies have explored how **subjective** (self-assessed) and **objective** (factual) knowledge **jointly moderate** the relationship between message quality and its **cognitive** (information processing) and **emotional** (helplessness) outcomes.

- This study develops an **integrative model** that:
- Links **perceived message quality → pro-environmental behavior**
- Through **information processing** and **learned helplessness**
- And examines the **moderating role** of **consumer knowledge profiles**

Introduction

Research Model



Research Questions

1. Are perceived environmental message quality (complexity, bias, and overload) significantly associated with systematic and heuristic information processing?
2. Are perceived environmental message quality (complexity, bias, and overload) significantly associated with learned helplessness?
3. Are systematic and heuristic information processing and learned helplessness significantly associated with pro-environmental behavior?
4. Do consumer knowledge profiles moderate the associations between perceived environmental message quality and (a) systematic information processing, (b) heuristic information processing, and (c) learned helplessness?
5. Do consumer knowledge profiles moderate the associations of (a) systematic information processing, (b) heuristic information processing, and (c) learned helplessness with pro-environmental behavior?

Method

Data and Sample

- Data were obtained from the **Public Attitudes towards the Environment: 2023 Survey**, conducted by the **Korea Environment Institute (KEI).**
- The dataset includes **3,088 respondents**, aged **19 to 69**, representing a **nationally representative sample.**

- These individual-level data provide a strong basis for analyzing **psychological mechanisms**, such as:
  - **Information processing**
  - **Learned helplessness**

- The dataset enables a **robust** and **generalizable** examination of how consumers respond to environmental messages, and how these responses influence **pro-environmental behavior.**

Method

Variables

Dependent Variable

- **Pro-Environmental Behavior (PEB)** was measured using a **single-item bipolar scale.**

- Respondents were asked to indicate which statement better reflects their current lifestyle:
- **A**. "I prioritize environmentally friendly behaviors (e.g., saving energy, reducing single-use items), even if it means some inconvenience."
- **B**. "To be honest, convenience in daily life is my top priority.“

- Responses were recorded on a **5-point scale**:
- 1 = Strongly agree with A ~ 5 = Strongly agree with B
- The scale was **reverse-coded**, so that higher scores indicate stronger pro-environmental behavioral tendencies.

Method

Variables

Independent Variables

- **Perceived Environmental Message Complexity (PEMC)**
- Measured with **3 items** (5-point Likert scale)
- Captures difficulty in processing environmental messages due to:
    - Uncertainty about where to find relevant content
    - Confusing complexity of messages
    - Blending of facts and opinions

- **Perceived Environmental Message Bias (PEMB)**
- Measured with **2 items** (5-point Likert scale)
- Captures perceived lack of objectivity due to:
    - Exaggeration
    - Politically or ideologically driven agendas

- **Perceived Environmental Message Overload (PEMO)**
- Measured with **3 items** (5-point Likert scale)
- Captures information fatigue, including:
    - Repetitive content
    - Message saturation
    - Overexposure through media or social circles

Method

Variables

Mediation Variables

- **Systematic Information Processing (SIP)**
- Measured with **3 items** (5-point Likert scale)
- Captures active engagement with information:
  - Seeking additional information
  - Discussing new knowledge
  - Reflecting thoughtfully on environmental topics

- **Heuristic Information Processing (HIP)**
- Measured with **2 items** (5-point Likert scale)
- Captures passive processing tendencies:
  - Superficial exposure
  - Minimal time or effort spent on interpretation

- **Learned Helplessness (LH)**
- Measured with **3 items** (5-point Likert scale)
- Captures beliefs that environmental efforts are ineffective, due to:
  - Lack of global cooperation
  - Limited participation
  - Perception that the problem is already irreversible

Method

Variables

Moderation Variables

- **Consumer knowledge profiles** were constructed by combining:
- **Objective knowledge** (10 quiz-style items)
- Coded as: 1 = correct, –1 = incorrect, 0 = don’t know
- Total score classified as high or low via **median split**

- **Subjective knowledge** (2 items on self-rated understanding)
- Measured on a **5-point Likert scale**
- Averaged and split by median into high or low

Table 1. Knowledge Profiles

	High Objective Knowledge	Low Objective Knowledge
High Subjective Knowledge	Expert	Overconfident
Low Subjective Knowledge	Underconfident	Indifference

Method

Analysis

- **Exploratory Factor Analysis (EFA)**
  - Conducted with **oblique rotation**
  - Identified the **underlying factor structure**

- **Confirmatory Factor Analysis (CFA)**
  - Assessed **model fit**
  - Validated the **measurement model**

- **Structural Equation Modeling (SEM)**
  - Tested the relationships among latent constructs

- **Multi-Group Analysis**
  - Examined the **moderating role** of consumer knowledge profiles

- Software: All analyses were performed using Stata 18.0

Results

Assessment of Reliability and Convergent Validity

- Table 2 presents the EFA results

- A total of **six distinct factors** were extracted

→ Well-aligned with the **theoretical constructs**

- **All factor loadings > 0.4**

→ Indicates strong **internal consistency** across items

- **All eigenvalues > 1.0**

→ Confirms that each factor explains a **meaningful portion of variance**

Table 2. Result of Exploratory Factor Analysis

Factor	Item	Factor loading	Eigen value
PEMC	(PEMC1) I don't know where to find the environmental information I need.	0.797	1.546
	(PEMC2) Most environmental information is too difficult to understand.	0.726	
	(PEMC3) Environmental information often mixes facts and opinions, making it hard to identify accurate information.	0.485	
PEMB	(PEMB1) I think some environmental information is intentionally biased or created for specific agendas.	0.849	1.421
	(PEMB2) Environmental information is often exaggerated and emotionally charged.	0.632	
PEMO	(PEMO1) Environmental information keeps repeating similar content, so there's nothing new.	0.527	1.448
	(PEMO2) I feel that information stressing the importance of the environment has already been heard enough.	0.844	
	(PEMO3) (Media and people around me) talk too much about the environment.	0.530	
SIP	(SIP1) I try to learn more about the environment.	0.739	1.617
	(SIP2) I talk to others about new things I've learned about the environment.	0.789	
	(SIP3) I reflect on environmental issues when they come up.	0.636	
HIP	(HIP1) I casually listen to environmental information.	0.995	1.296
	(HIP2) I don't spend time thinking deeply about environmental issues after encountering them.	0.415	
LH	(LH1) Even if Korea tries to reduce greenhouse gases, it's meaningless because other countries act differently.	0.774	1.434
	(LH2) If others don't join, my individual effort to protect the environment is meaningless.	0.732	
	(LH3) It is already too late to solve environmental problems.	0.494	
Cumulative %		0.548	
Kaiser-Meyer-Olkin measure of sampling adequacy		0.790	
Bartlett's test of sphericity		Chi-Square = 14449.157*** df = 120	

Notes: ***p<.001, PEMC: Perceived Environmental Message Complexity, PEMB: Perceived Environmental Message Bias, PEMO: Perceived Environmental Message Overload, SIP: Systematic Information Processing, HIP: Heuristic Information Processing, LH: Learned Helplessness

Results

Assessment of Reliability and Convergent Validity

- **Model Fit Indices**
- $\chi^2(89) = 1205.27$, CFI = 0.922, TLI = 0.895, RMSEA = 0.064, SRMR = 0.041

→ Indicates **good overall model fit**

- **Convergent Validity**
- Standardized factor loadings: All > 0.50
- **Composite Reliability**: All > 0.70, except HIP = 0.672

→ Still acceptable, since **AVE > 0.50**

- **Average Variance Extracted** (AVE):
- 0.50 for all, except PEMO (0.461) and LH (0.468)
- CR > 0.70 for both → Acceptable (Fornell & Larcker, 1981)

- **Discriminant Validity**
- Fornell–Larcker criterion met:
- √AVE > highest inter-construct correlation

Table 3. Result of Confirmatory Factor Analysis

Factor	Item	Factor loading	M(SD)	CR	AVE	Ca
PEMC	PEMC1	0.704	3.31 (0.70)	0.765	0.521	0.764
	PEMC2	0.759				
	PEMC3	0.701				
PEMB	PEMB1	0.745	3.27 (0.83)	0.741	0.589	0.740
	PEMB2	0.790				
PEMO	PEMO1	0.718	2.97 (0.72)	0.717	0.461	0.710
	PEMO2	0.737				
	PEMO3	0.568				
SIP	SIP1	0.730	3.39 (0.64)	0.770	0.528	0.768
	SIP2	0.765				
	SIP3	0.683				
HIP	HIP1	0.760	2.88 (0.73)	0.672	0.507	0.668
	HIP2	0.661				
LH	LH1	0.785	2.87 (0.85)	0.721	0.468	0.712
	LH2	0.698				
	LH3	0.549				
χ^2= 1205.27(P = 0.000), df = 89, CFI = 0.922, TLI = 0.895, RMSEA = 0.064, SRMR = 0.041						

Notes: SD=standard deviation, FL=Factor Loading, CR=composite reliability, AVE=average variation extracted, Cα=cronbach's α, PEMC: Perceived Environmental Message Complexity, PEMB: Perceived Environmental Message Bias, PEMO: Perceived Environmental Message Overload, SIP: Systematic Information Processing, HIP: Heuristic Information Processing, LH: Learned Helplessness

Table 4. Discriminant Validity Assessment

Construct	1	2	3	4	5	6
1. PEMC	**0.722**					
2. PEMB	0.601***	**0.767**				
3. PEMO	0.399***	0.610***	**0.679**			
4. SIP	0.026	-0.003	-0.067**	**0.727**		
5. HIP	0.308***	0.324***	0.461***	-0.364***	**0.712**	
6. LH	0.314***	0.344***	0.471***	-0.077**	0.348	**0.684**

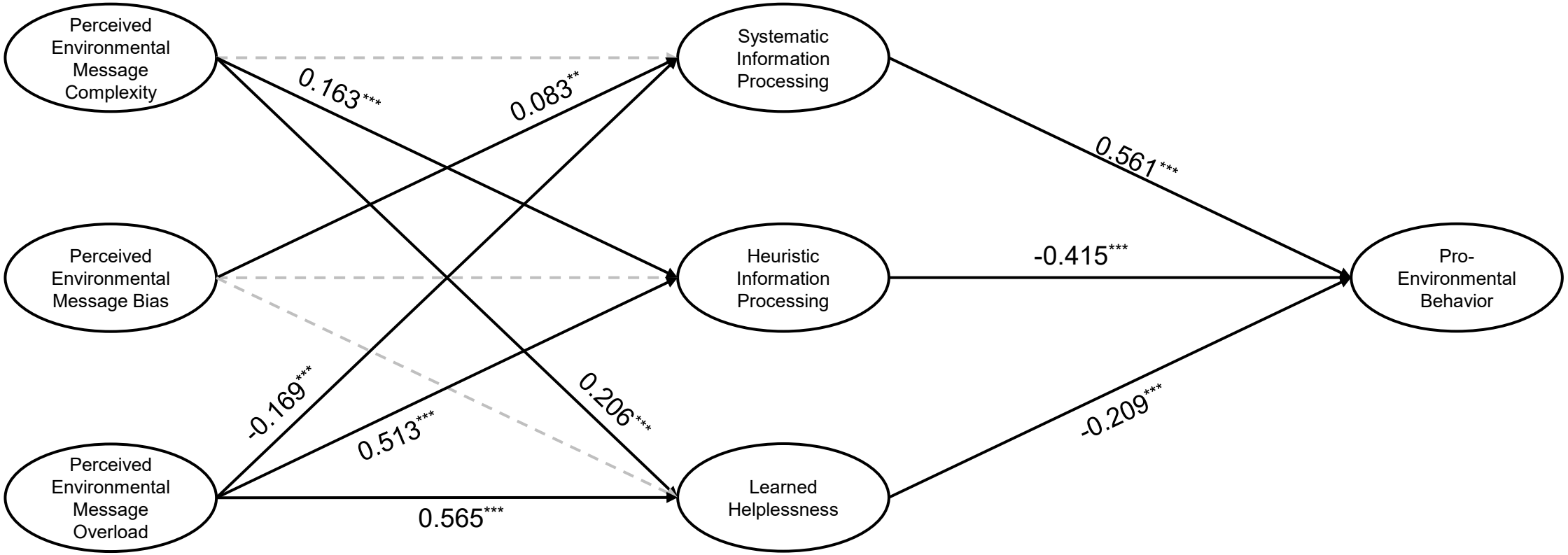
Notes: Bold values on the diagonal are the square root of AVE, while others are correlations. *p<.05, **p<.01, ***p<.001, PEMC: Perceived Environmental Message Complexity, PEMB: Perceived Environmental Message Bias, PEMO: Perceived Environmental Message Overload, SIP: Systematic Information Processing, HIP: Heuristic Information Processing, LH: Learned Helplessness

Results

The Results of the Structural Equation Modeling

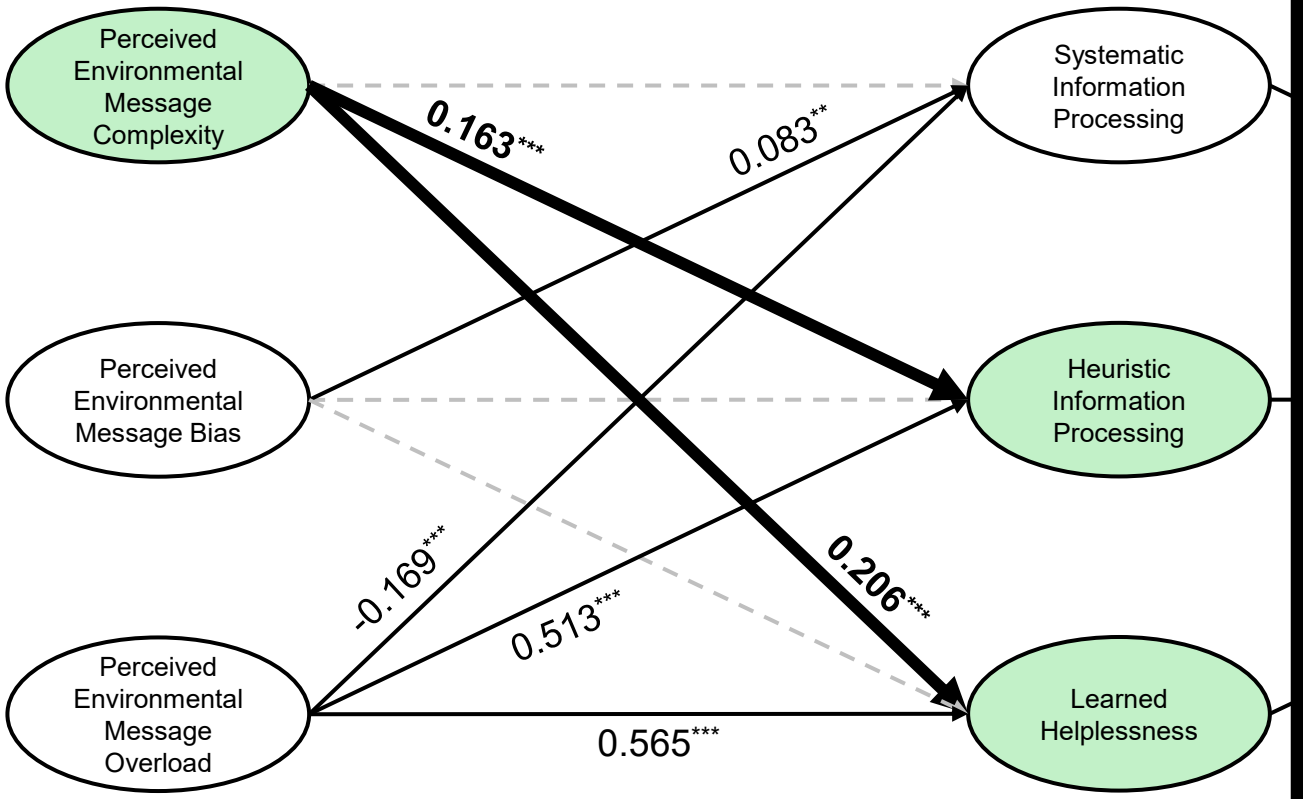
Model Fit

- $\chi^2(105) = 1526.30$, $p < .001$
- CFI = 0.905, TLI = 0.878, RMSEA = 0.066, SRMR = 0.054



Results

The Results of the Structural Equation Modeling



Perceived Message Complexity (PEMC)

→ SIP: β = 0.034 (n.s.)

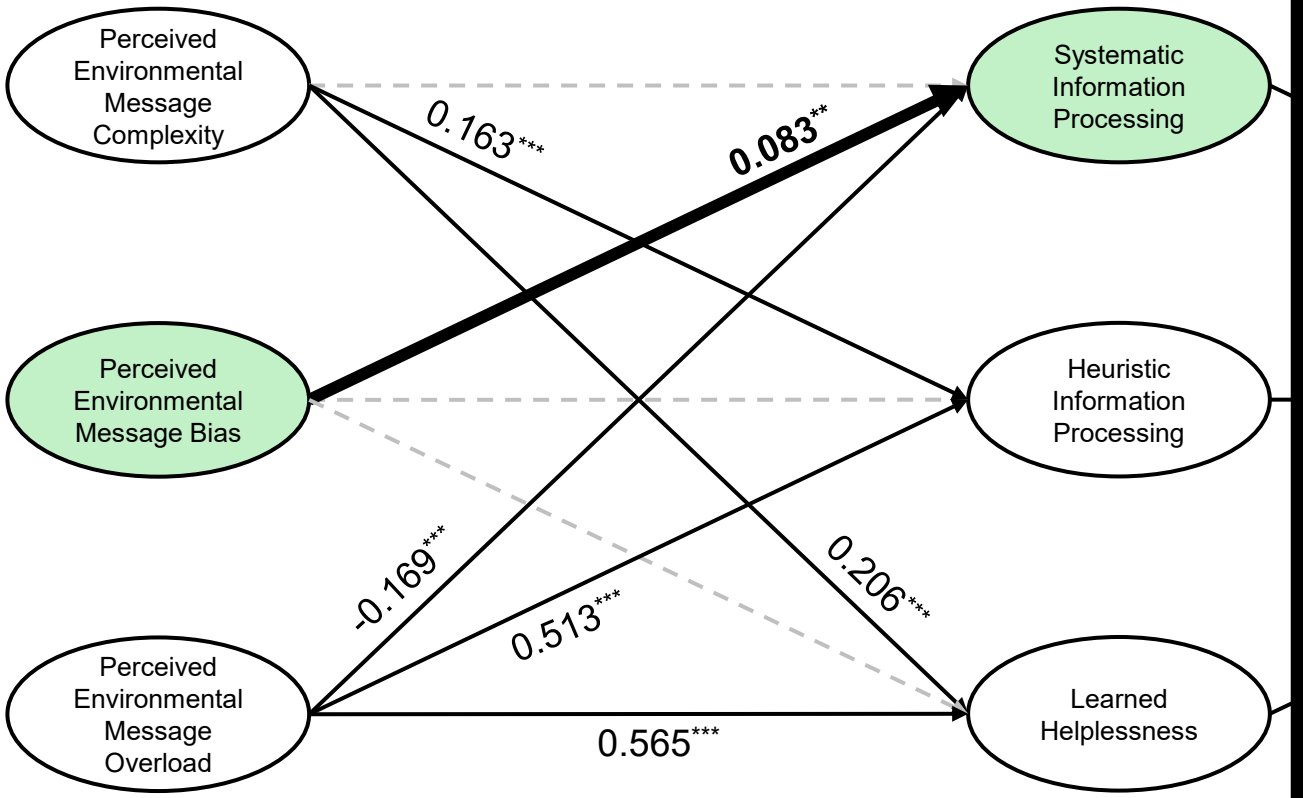
→ HIP: β = 0.140 ($p < .001$)

→ LH: β = 0.152 ($p < .001$)

→ Complexity leads to disengagement and heuristic processing

Results

The Results of the Structural Equation Modeling



Perceived Message Bias (PEMB)

→ SIP: β = 0.101 (p < .01)

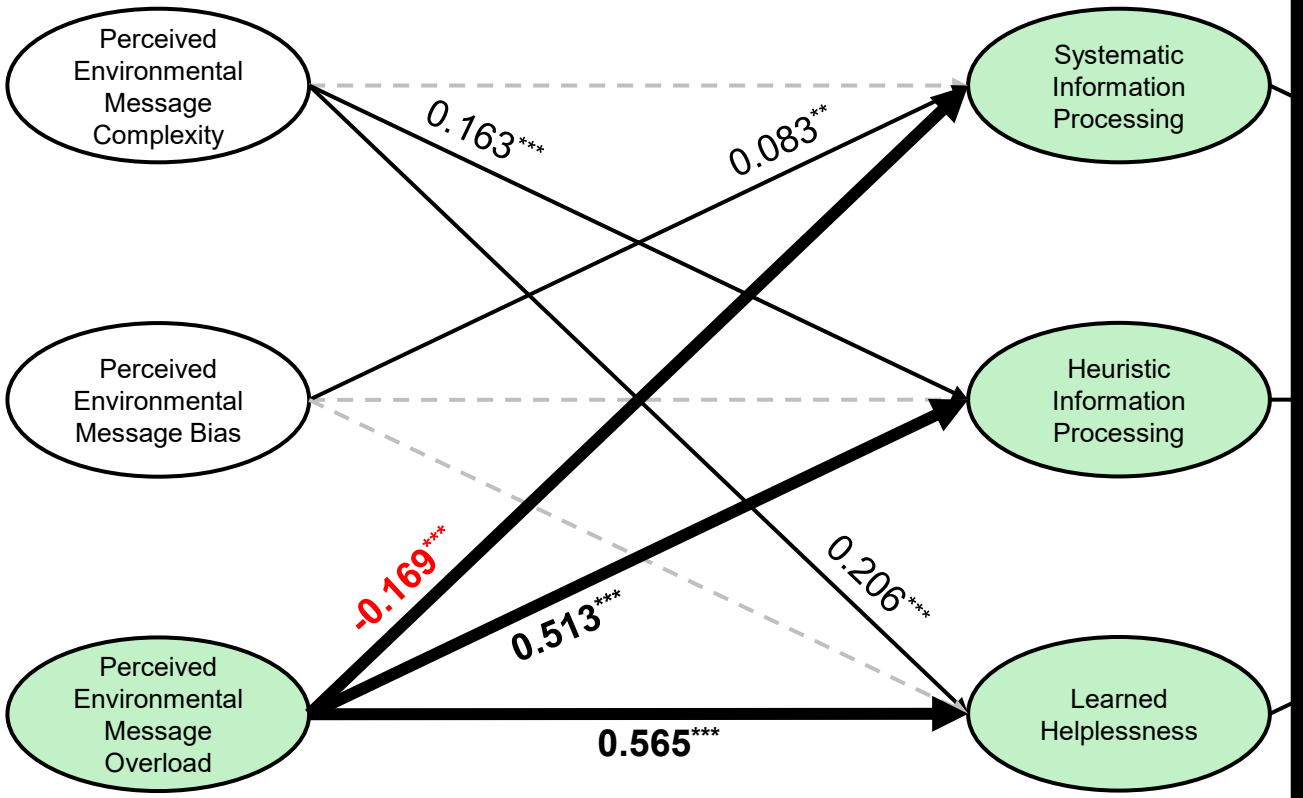
→ HIP: β = –0.069 (n.s.)

→ LH: β = –0.023 (n.s.)

→ Bias may encourage more critical, deliberate thinking

Results

The Results of the Structural Equation Modeling



Perceived Message Overload (PEMO)

→ SIP: β = –0.194 ($p < .001$)

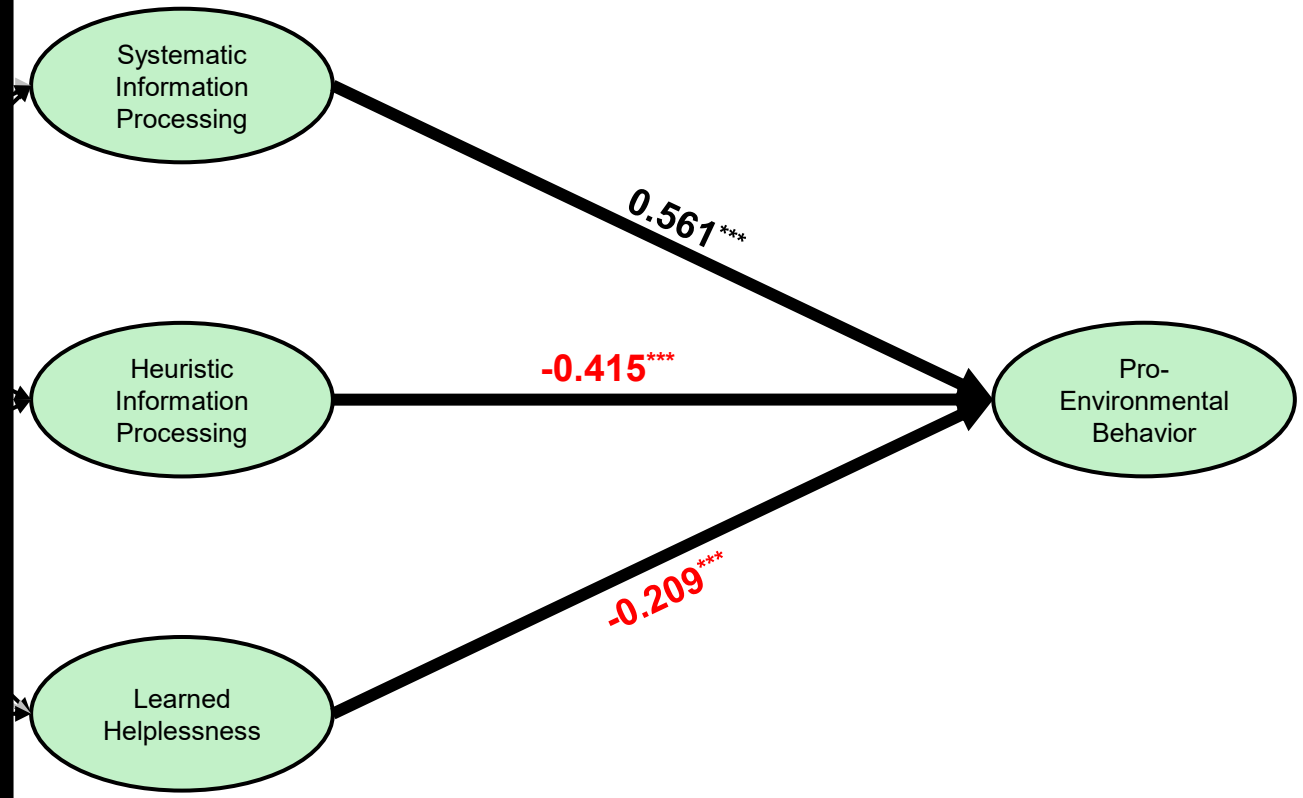
→ HIP: β = 0.470 ($p < .001$)

→ LH: β = 0.423 ($p < .001$)

→ Overload undermines deep processing, increases helplessness

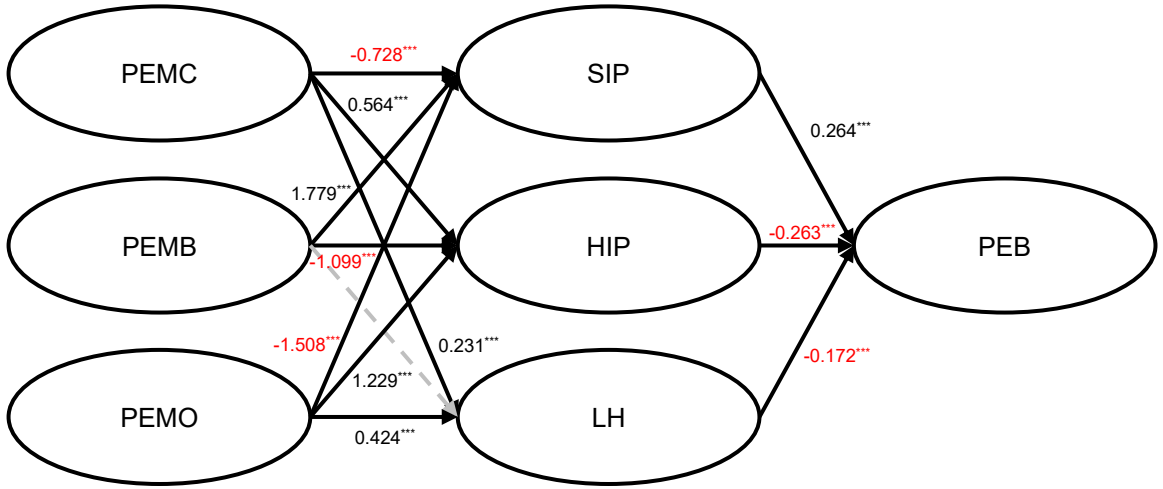
Behavioral Outcomes

- SIP → PEB: β = 0.281 (p < .001)
- HIP → PEB: β = –0.260 (p < .001)
- LH → PEB: β = –0.153 (p < .001)
- Systematic processing promotes PEB; heuristic processing and helplessness hinder it.

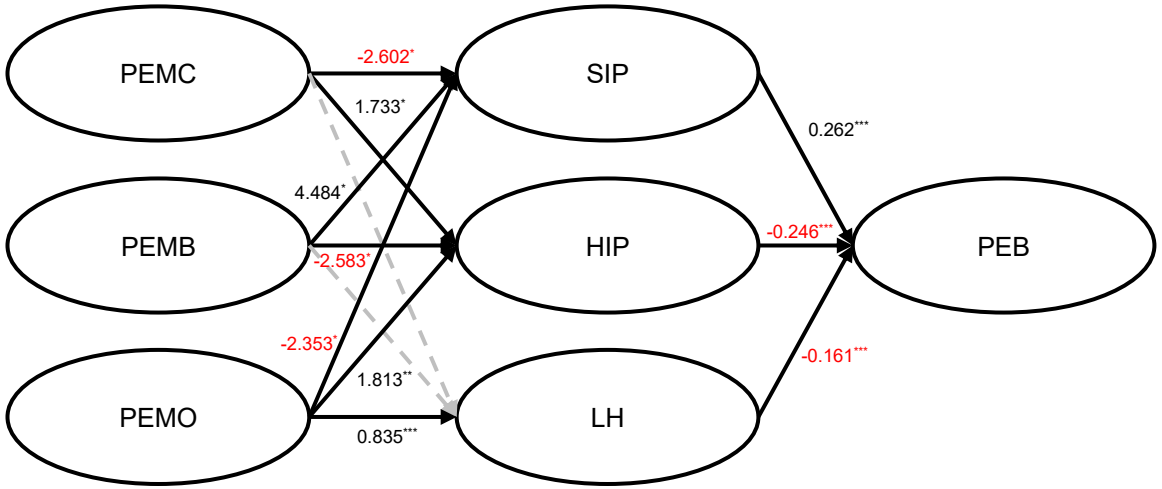


Results

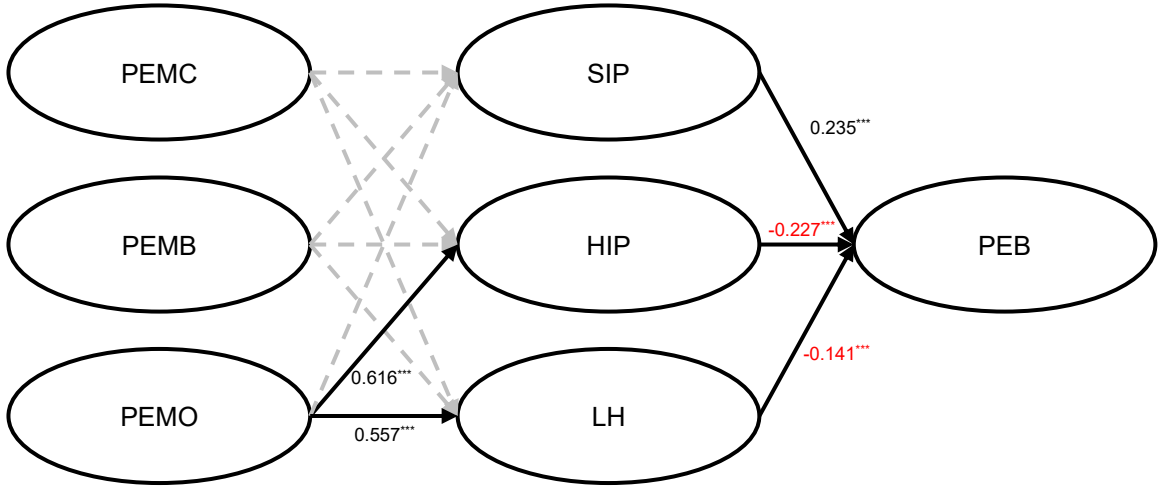
Multi-Group Analysis by Consumer Knowledge Profiles



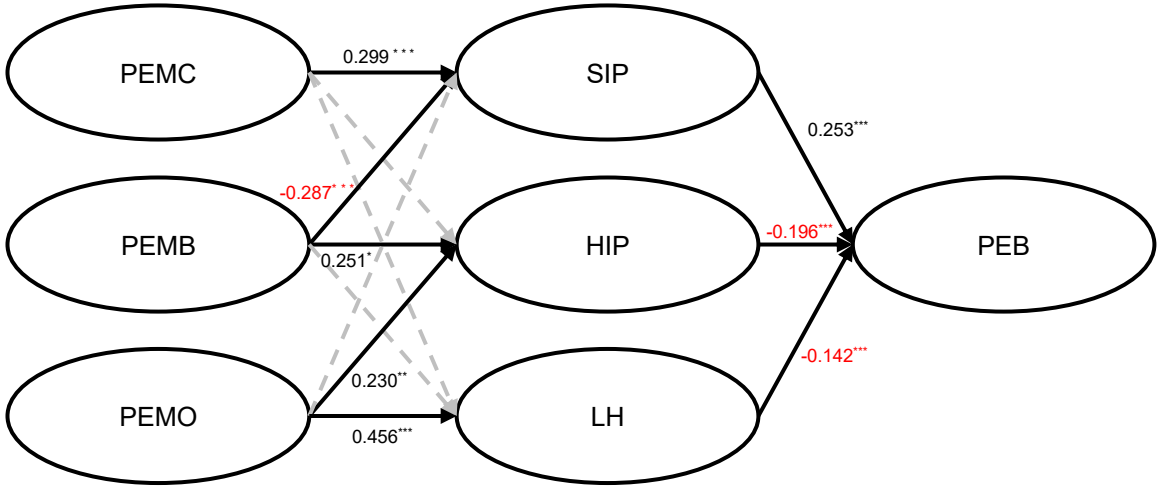
Expert (N = 1,023)



Overconfident (N = 706)



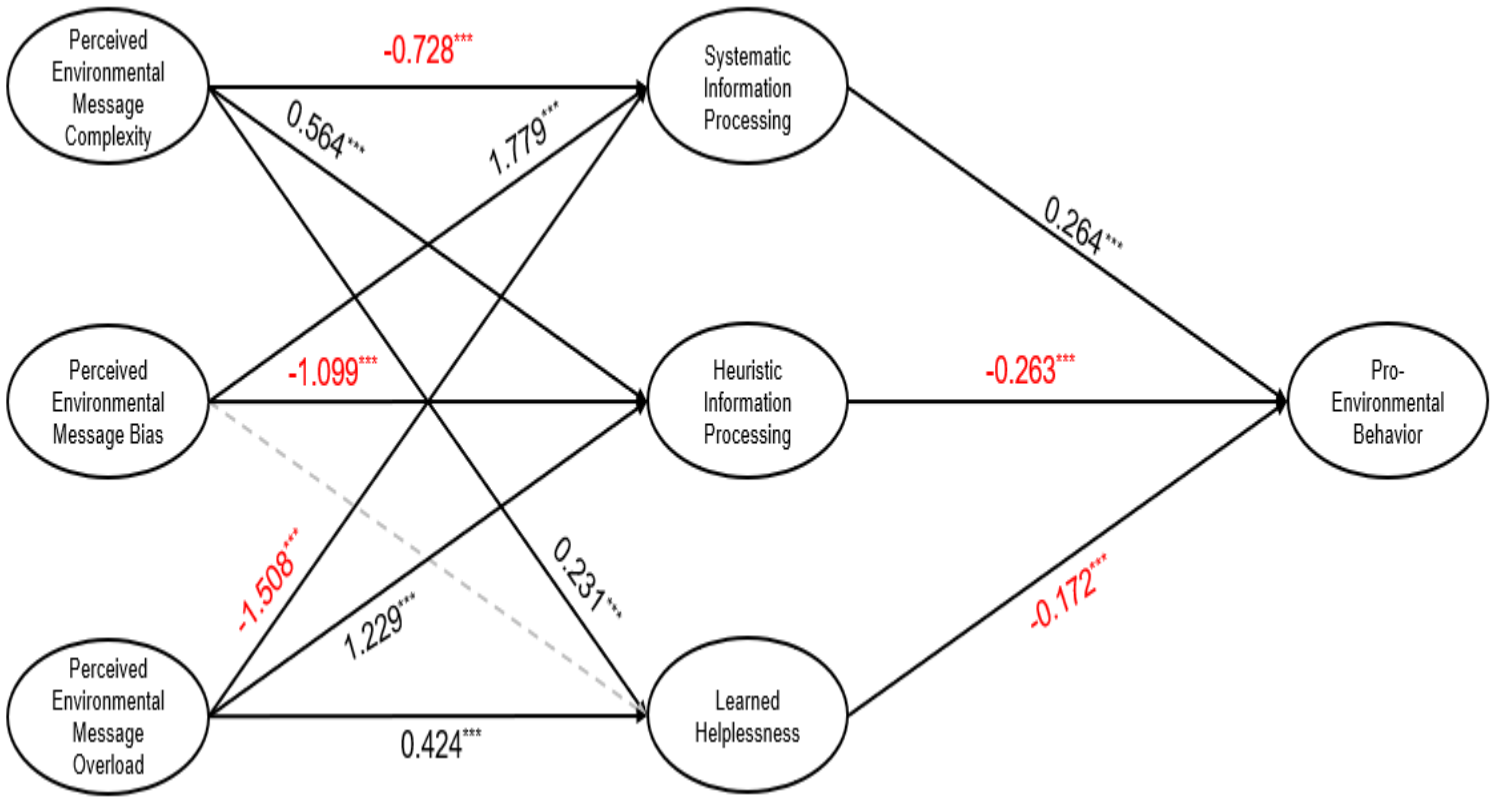
Underconfident (N = 638)



Indifference (N = 721)

Results

Multi-Group Analysis by Consumer Knowledge Profiles



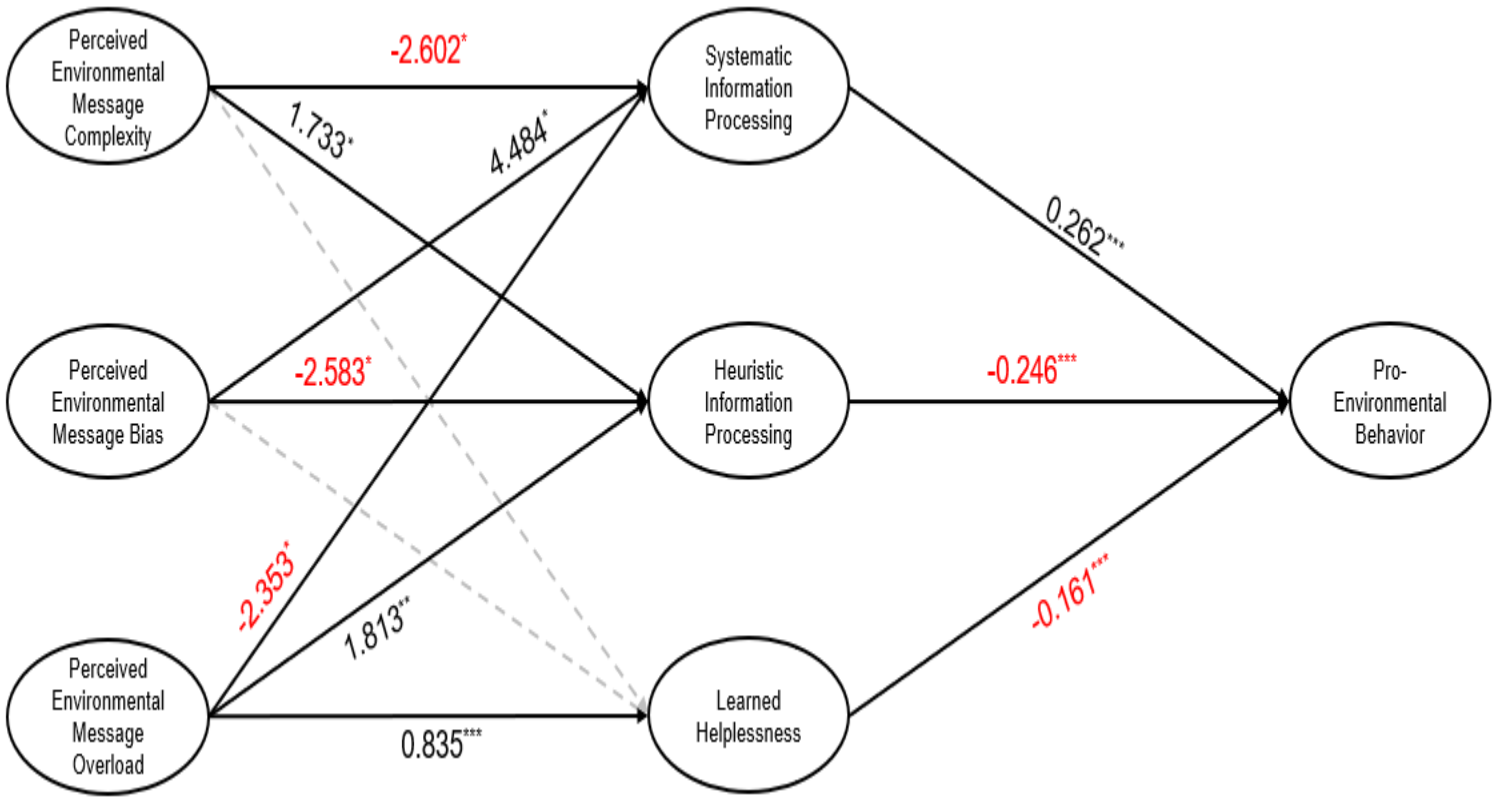
Expert (N = 1,023)

Expert Group

- Message Complexity
  - → SIP (–), HIP (+), LH (+)
- Message Overload
  - → SIP (–), HIP (+), LH (+)
  - → Even experts disengage when content feels redundant or excessive.
- Message Bias
  - → SIP (+), HIP (–)
  - → They process biased messages more deeply, critically.

Results

Multi-Group Analysis by Consumer Knowledge Profiles



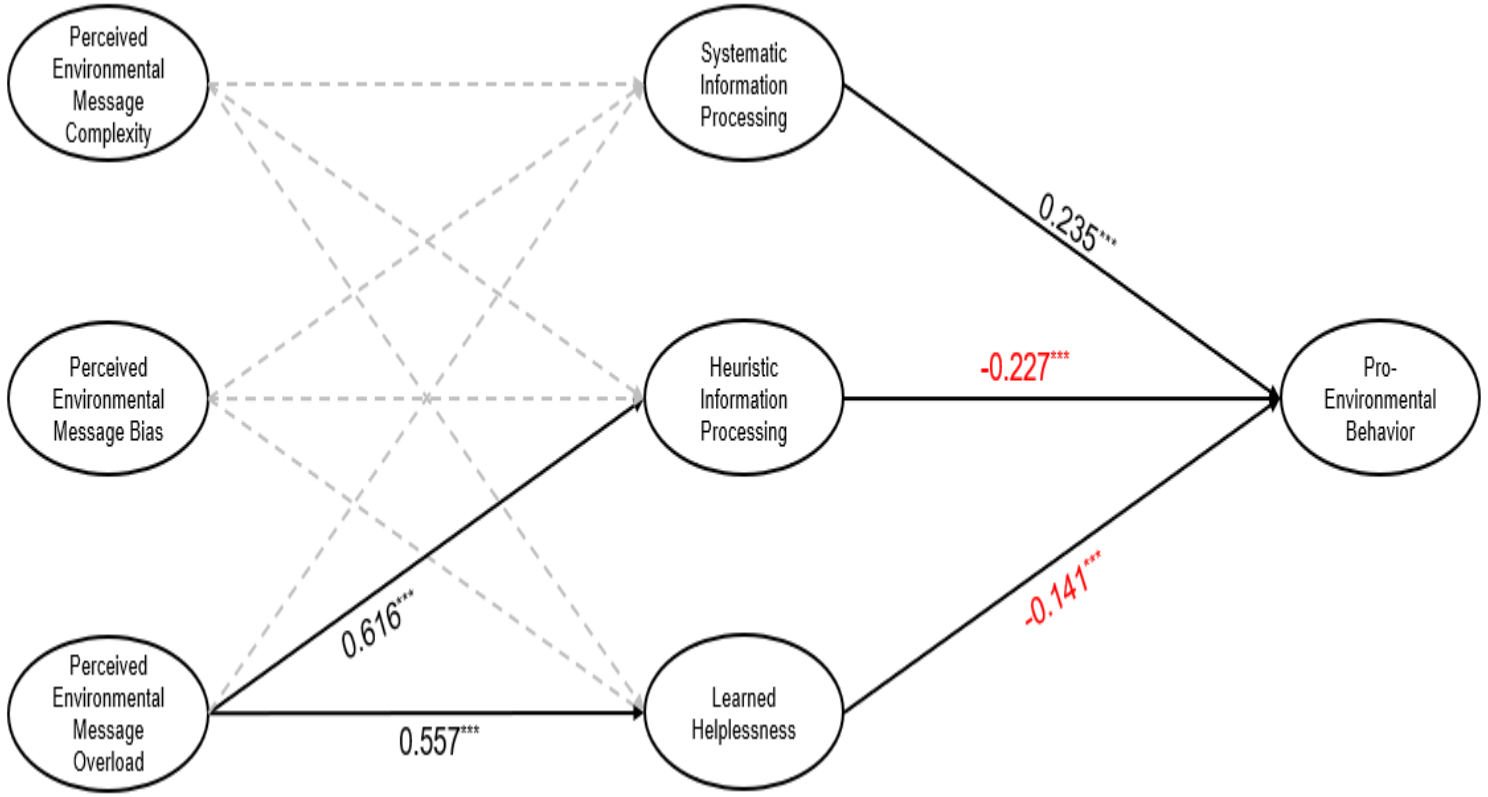
Overconfident (N = 706)

Overconfident Group

- Message Complexity
  - → SIP (–), HIP (+)
- Message Overload
  - → SIP (–), HIP (+), LH (+)
  - → They avoid effort when messages are too dense or repetitive.
- Message Bias
  - → SIP (+), HIP (–)
  - → They critically engage with biased content to validate their views.

Results

Multi-Group Analysis by Consumer Knowledge Profiles



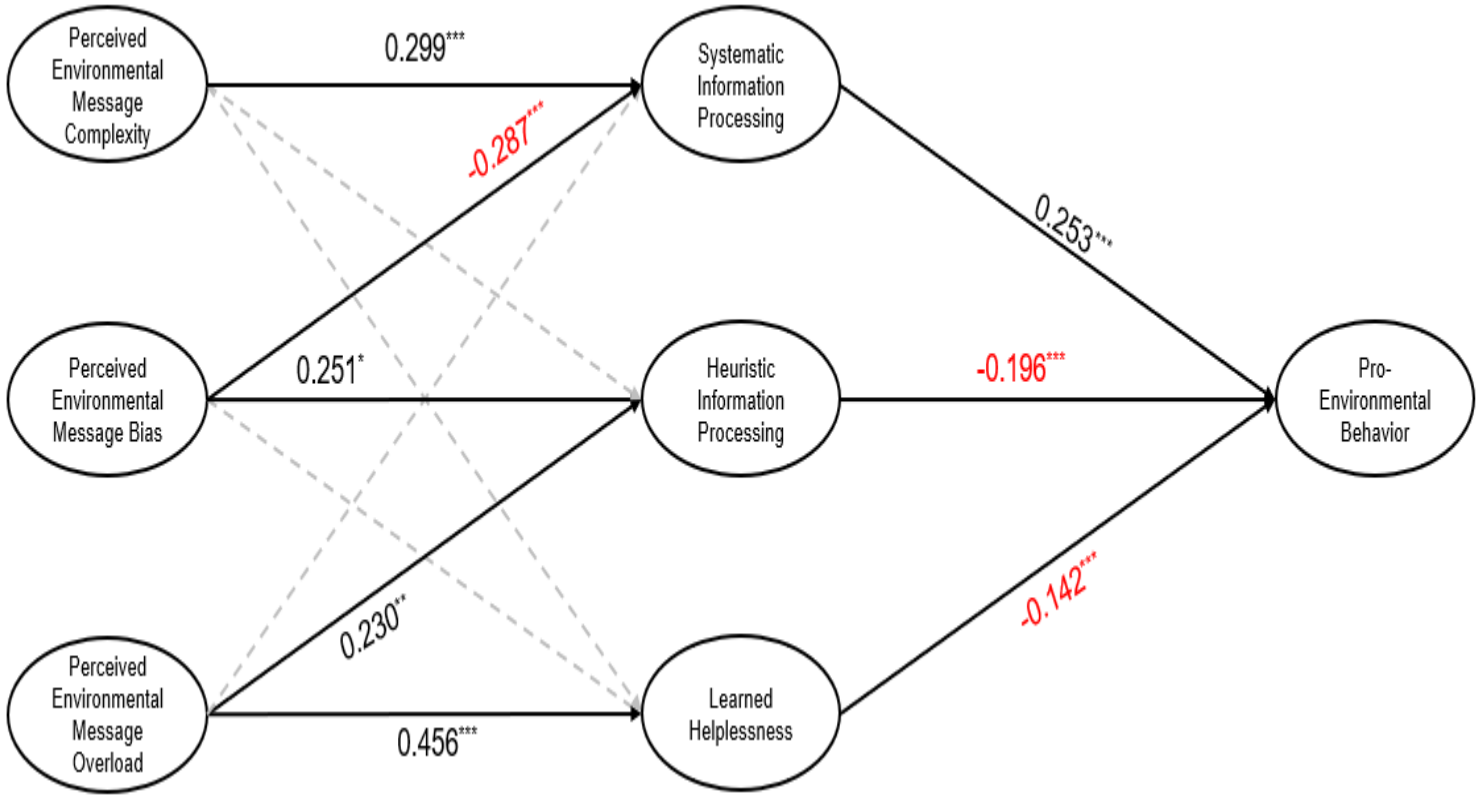
Underconfident (N = 638)

Underconfident Group

- Message Overload
  - → HIP (+), LH (+)
  - → Even knowledgeable consumers feel overwhelmed when there's too much content

Results

Multi-Group Analysis by Consumer Knowledge Profiles



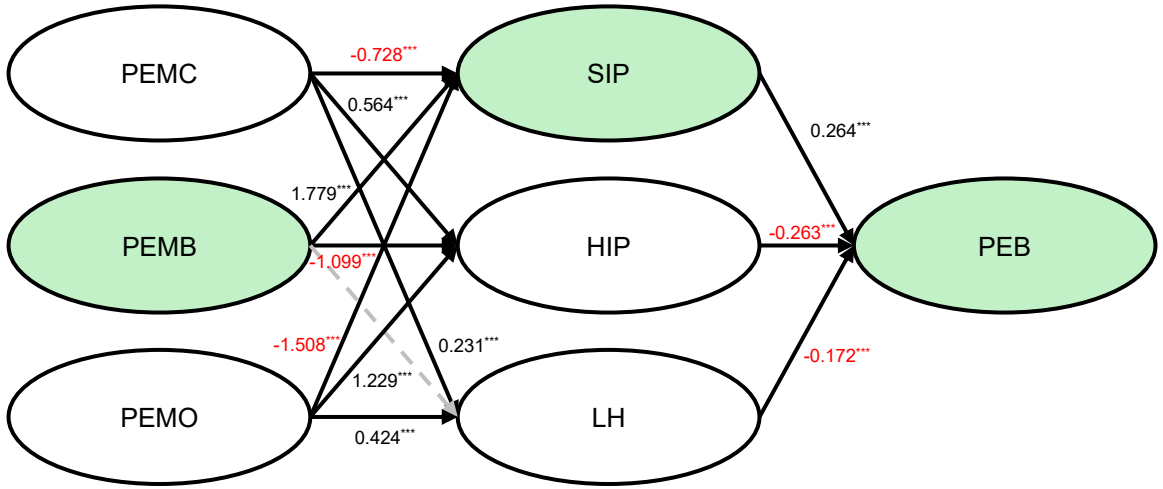
Indifference (N = 721)

Indifference Group

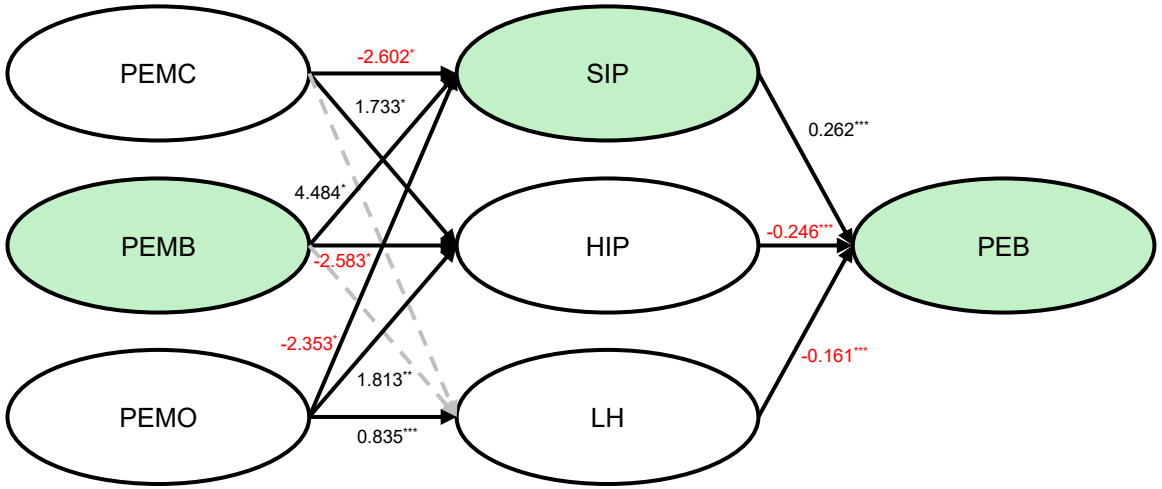
- Message Complexity
  - → SIP (+)
  - → They try to make sense of complex messages by seeking more information.
- Message Bias
  - → SIP (–), HIP (+)
- Message Overload
  - → HIP (+), LH(+)
  - → Too much exposure leads to confusion and emotional fatigue.

Results

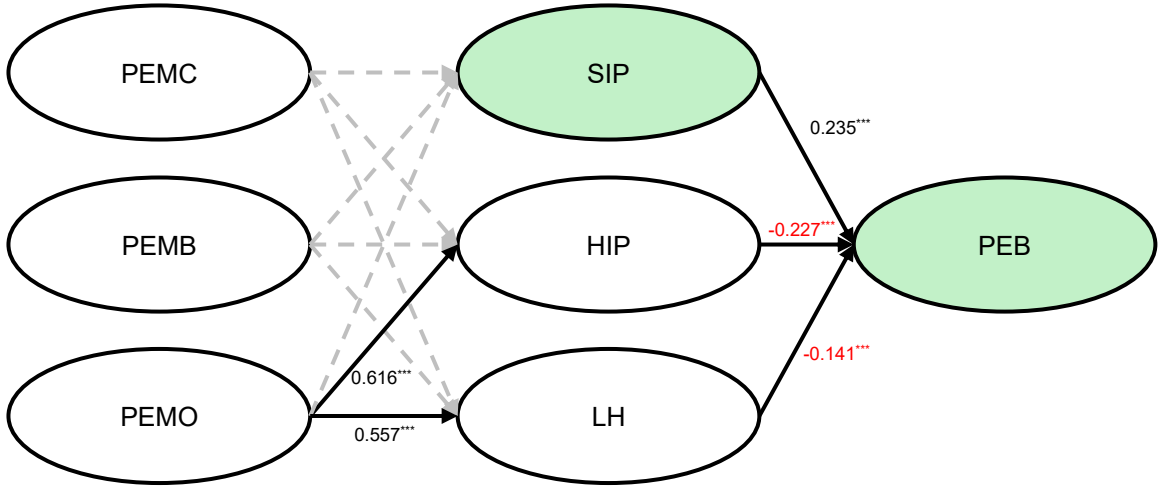
Multi-Group Analysis by Consumer Knowledge Profiles



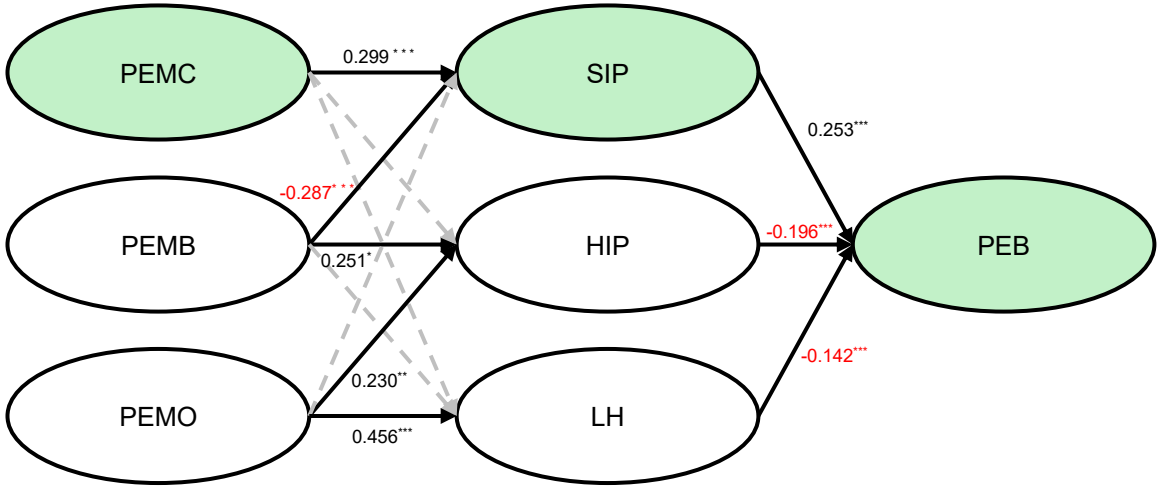
Expert (N = 1,023)



Overconfident (N = 706)



Underconfident (N = 638)



Indifference (N = 721)

Conclusion

Main findings

- **Perceived message quality** (complexity, bias, overload) influences pro-environmental behavior via two psychological pathways:
  - **Cognitive:**
    - Systematic Information Processing → Pro-environmental behavior ↑
    - Heuristic Information Processing → Pro-environmental behavior ↓
  - **Emotional:**
    - Learned Helplessness → Pro-environmental behavior ↓

- **Message overload** was **consistently linked** to learned helplessness across **all knowledge profiles**

  → a universal emotional barrier

- Effects of message complexity, bias, and overload **differ by consumer knowledge profiles**
  - **Expert**: Perceived Message **Bias** is positively associated with SIP.
  - **Overconfident**: Perceived Message **Bias** is positively associated with SIP.
  - **Underconfident**: No variables show a significant positive association with SIP.
  - **Indifference**: Perceived Message **Complexity** is positively associated with SIP.

Conclusion

Theoretical Contributions

- Offers an **integrated framework** linking **message perception, information processing, and learned helplessness** as dual pathways to behavior
- Highlights the **moderating role of consumer knowledge profiles**, demonstrating that **cognitive and emotional responses** are **not uniform**
- Challenges the assumption that **complexity is always detrimental**—showing it can foster **constructive engagement** under certain conditions

Practical Contributions

- Urges caution against **one-size-fits-all** communication:
  - Simplifying content may not always work, especially for the **Indifference group**
- Recommends **segmented communication strategies**:
  - **Experts / Overconfident**: Provide **balanced, critically engaging** content
  - **Indifference**: Leverage **moderate complexity** to stimulate SIP
  - **All groups**: **Minimize overload** to reduce helplessness

E.O.D