

Examining the Gap between Eco-Friendly Intention and Behavior Using SEM-Based Meta-Analysis

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- Introduction
- Related Studies
- Theory of Planned Behavior
- SEM-Based Meta-Analysis
- Data Collection
- Analysis and Discussion
- Conclusion

- Motivation: comparable lack of research into pro-environmental behaviors (PEBs) in employees and vehicle operators, vs. research into physical / logistical improvements
 - Engineering and logistical solutions preferred vs. behavioral
- I am a PhD student working with Dr. Seong-Jong Joo
 - We wish to analyze PEBs in vehicle operation
 - First we must undertake a meta-analysis of general PEBs in current literature
 - We investigate the relationship between Intention (INT) and Behavior (BEH) via the Theory of Planned Behavior (TPB)

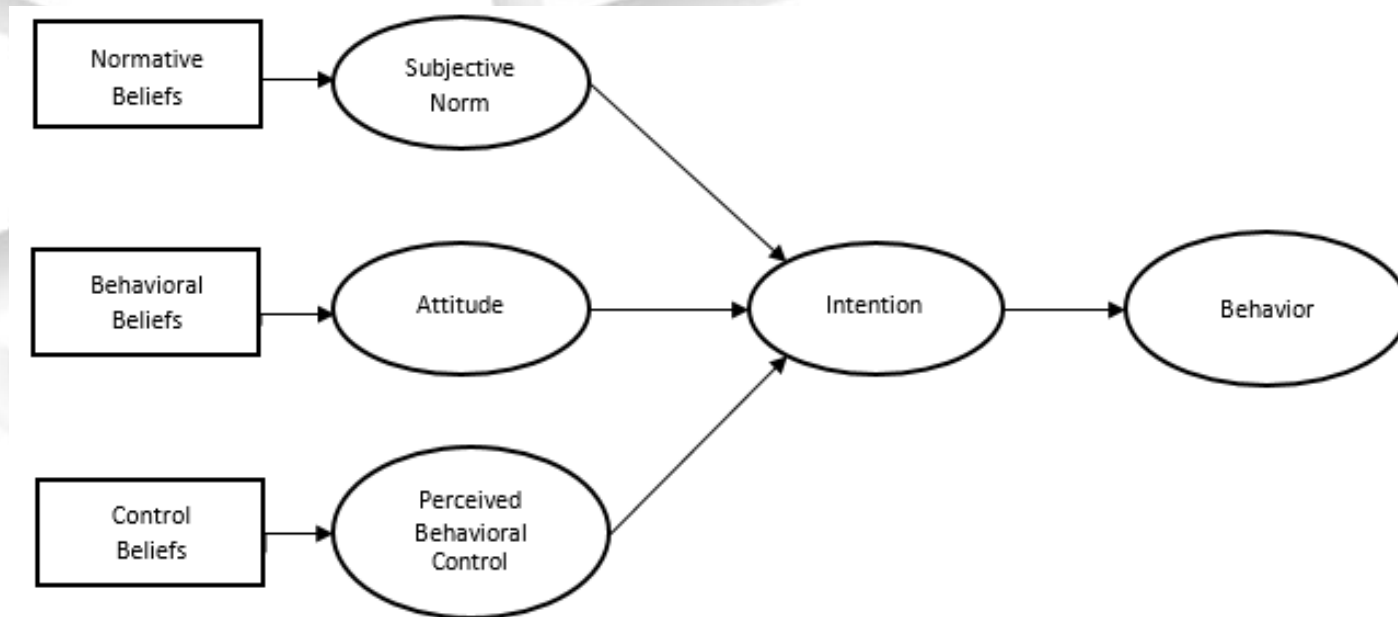
Related Studies: PEB Effects

| Primary Behavior Type | #Effects | Description |
|-----------------------|----------|------------------------------------------------------------------------|
| Civic | 5 | Engagement with community / local governance |
| Clothing | 1 | Selection of sustainable / responsibly sourced clothing |
| Energy | 10 | Energy conservation |
| Food | 19 | Sustainable / responsible food selection or agriculture practices |
| Generalized | 22 | Non-specific constructs, often incorporate multiple PEBs |
| Health | 1 | Responsible behaviors in healthcare fields e.g. sharp disposal |
| Innovation | 4 | Corporate action to creatively develop new PEBs |
| Investing | 3 | Corporate or individual financial investment in green areas |
| Production | 2 | Corporate action towards sustainability / responsibility of production |
| Purchasing | 15 | Incorporating green concern into purchase decision making |
| Recycling | 30 | Reusing / recycling waste products |
| Tourism | 8 | Choosing green behaviors during tourism activities |
| Transport | 16 | Reducing environmental impact of transport / commuting |
| Waste | 6 | Non-recycling green behavior for waste mitigation |

| N_{studies} | $N_{\text{effect_sizes}}$ |
|----------------------|----------------------------|
| 77 | 142 |

Theory of Planned Behavior

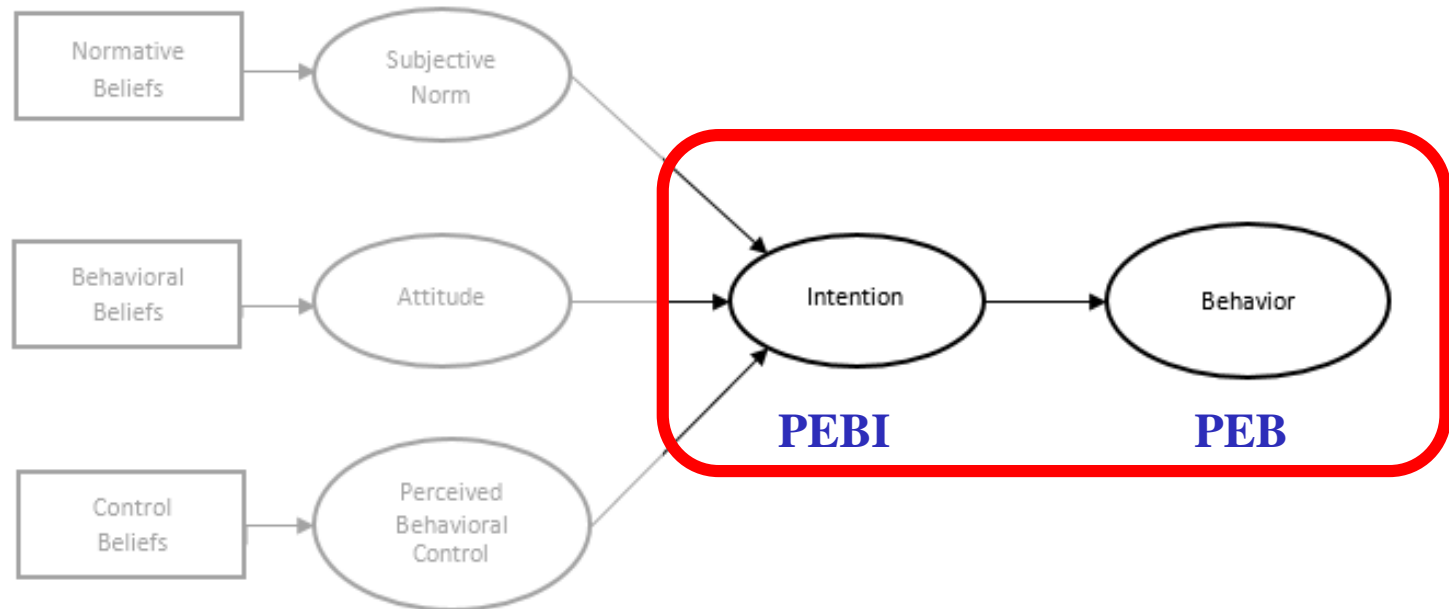
(Ajzen, 2017)



- Behavior follows primarily from intention (Ajzen, 2017)
- Intention preceded by antecedents composed of normative, behavioral, and control beliefs

Theory of Planned Behavior

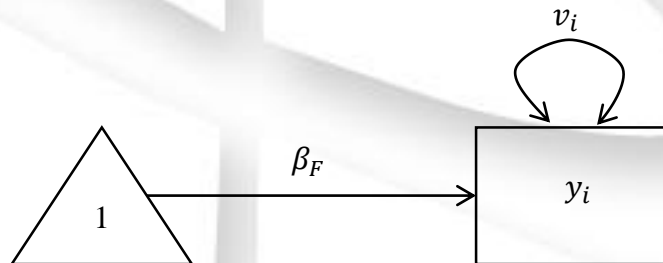
(Ajzen, 2017)



- This meta-analysis investigated link between pro-environmental intentions (PEBI) and pro-environmental behavior (PEB)

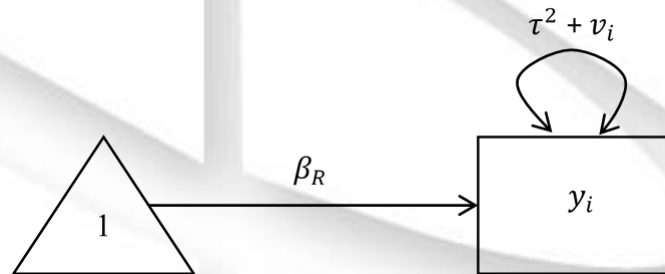
SEM-Based Meta-Analysis (1)

- Univariate SEM (Structural Equation Modeling) - based meta-analysis
- Fixed-effect model
 - Parameter (β_F) is constant across studies
 - $\mu_i(\theta) = \beta_F$ and $\sum_i(\theta) = v_i$
 - We estimate the population effect size (β_F) and sampling variance (v_i).



SEM-Based Meta-Analysis (2)

- Random-effect model
 - A one-factor confirmatory factor analysis (CFA) model
 - $\mu_i(\theta) = \beta_R$ and $\sum_i(\theta) = \tau^2 + v_i$
 - We estimate the population effect size (β_F) and its variance (τ^2) along with the sampling variance (v_i).



- **Included 142 effect sizes**
- **Criteria:**
 - **Intention**
 - **Behavior**
- **Most fruitful search terms:**
 - **“theory of planned behavior” AND “environmental”**
- **Databases Searched:**
 - **EBSCOHost**
 - **AFIT Library**
 - **Wright State University Archives (Psychology / Org Beh)**
 - **Google Scholar**

Results and Discussion (1)

• Fixed-Effect Model

| | Estimate | Std.Error | lbound | ubound | z value | Pr(> z) |
|------------|-----------|-----------|-----------|-----------|---------|---------------|
| Intercept1 | 0.8168827 | 0.0014915 | 0.8139594 | 0.8198059 | 547.7 | < 2.2e-16 *** |

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Q statistic on the homogeneity of effect sizes: 19020.37

Degrees of freedom of the Q statistic: 141

P value of the Q statistic: 0

Heterogeneity indices (based on the estimated Tau2):

| | Estimate |
|------------------------------|----------|
| Intercept1: I2 (Q statistic) | 0 |

Number of studies (or clusters): 142

Number of observed statistics: 142

Number of estimated parameters: 1

Degrees of freedom: 141

-2 log likelihood: 18374.76

Results and Discussion (2)

• Random-Effect Model

| | Estimate | Std.Error | lbound | ubound | z value | Pr(> z) |
|------------|-----------|-----------|-----------|-----------|---------|---------------|
| Intercept1 | 0.4761882 | 0.0211385 | 0.4347576 | 0.5176189 | 22.5271 | < 2.2e-16 *** |
| Tau2_1_1 | 0.0598885 | 0.0074778 | 0.0452322 | 0.0745447 | 8.0088 | 1.11e-15 *** |

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Q statistic on the homogeneity of effect sizes: 19020.37

Degrees of freedom of the Q statistic: 141

P value of the Q statistic: 0

Heterogeneity indices (based on the estimated Tau2):

| | Estimate |
|------------------------------|----------|
| Intercept1: I2 (Q statistic) | 0.994 |

Number of studies (or clusters): 142

Number of observed statistics: 142

Number of estimated parameters: 2

Degrees of freedom: 140

-2 log likelihood: 12.14401

Analysis and Discussion (3)

- The test statistic of the homogeneity of the effect size is Q (d.f. = 141) = 19,020.37, p -value ≈ 0 , which is statistically significant.
- τ^2 (Tau2-1-1) = 0.0599, and $I^2 = 0.994$.
- Thus, the between study heterogeneity is significant.
- Nonetheless, the effect size between Eco-friendly behavior and Intention is moderate (0.476) in the random effect model.

Results and Discussion (4)

- Study limitations and future directions
 - Significant between study heterogeneity: group studies according to their characteristics and include moderators for a mixed-effect model.
 - Univariate SEM-based meta-analysis: collect correlation matrices based on TPB and conduct multivariate meta-analytic SEM (MASEM) is recommended.

Conclusion (1)

- The purpose of this study is reviewing literature using a systematic approach
- We collected data ...
- We tried two univariate SEM-based meta-analysis models for finding the effect size of “Eco-friendly Intention” and “Behavior.”
- The studies included in the models showed significant heterogeneity.
- According to the random effect model, the effect size was moderate (0.476).

Conclusion (2)

- Future studies may try a mixed effect model to overcome heterogeneity among studies and conduct MASEM to understand eco-friendly behavior within a multivariate perspective.

Thank you!
Any questions?