

The Attitudinal Entropy (AE) Framework as a General Theory of Attitude

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The AE Framework - Background

- Aim: Explain many established phenomena using few first principles
- Based on analogical modeling (e.g., Haig, 2005)
- Statistical mechanics as starting point
 - Extremely advanced theory
 - Measurement model of attitude based on statistical mechanics principles (Dalege et al., 2016)

Dalege, J. et al. *Psychol. Rev.* **123**, 2-22 (2016).

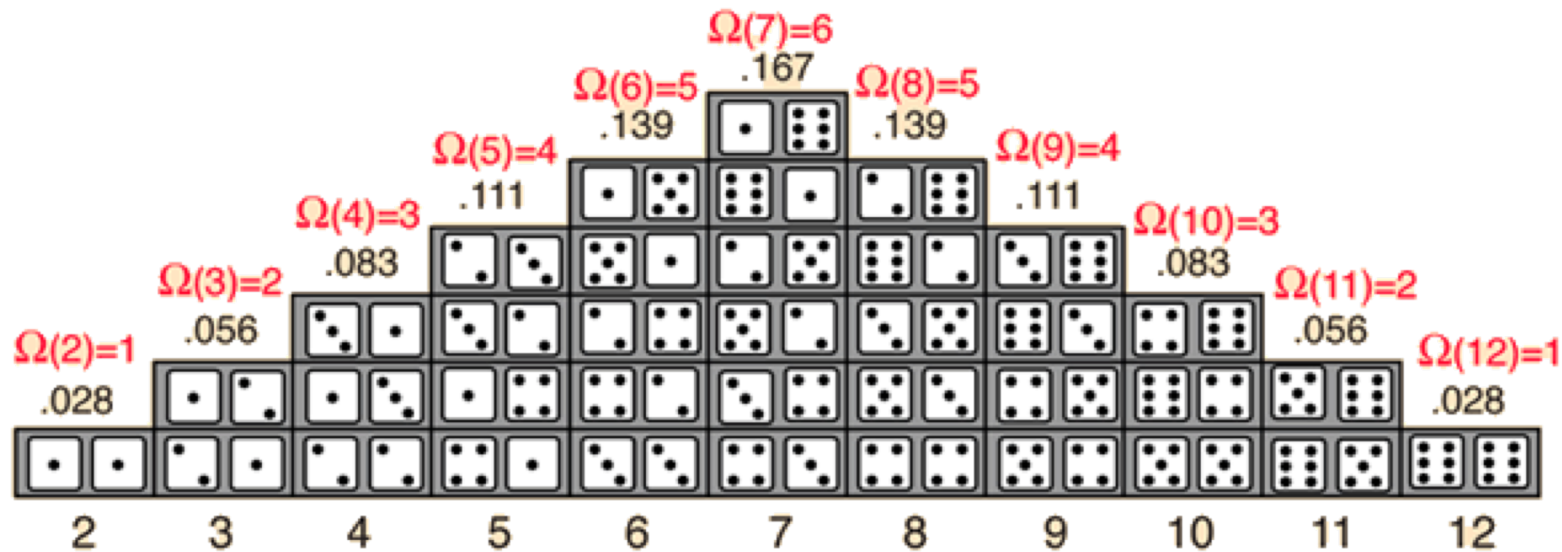
Haig, B. D. *Psychol. Methods*, *10*, 371-388 (2005).

The AE Framework - Background

- Fundamental properties of statistical mechanics:
 - Entropy
 - Energy
 - Temperature
- Analogies in attitude theory
 - Entropy: Inconsistency
 - Energy: Local processing mechanism to reduce global entropy
 - (Inverse) temperature: Thought and attention directed at the attitude object

The AE Framework - Preliminaries

- Micro- and Macrostates of Attitudes:
 - Microstate: Exact configuration of attitude elements
 - Macrostate: Number of positive vs. negative attitude elements



Total number of microstates: 36

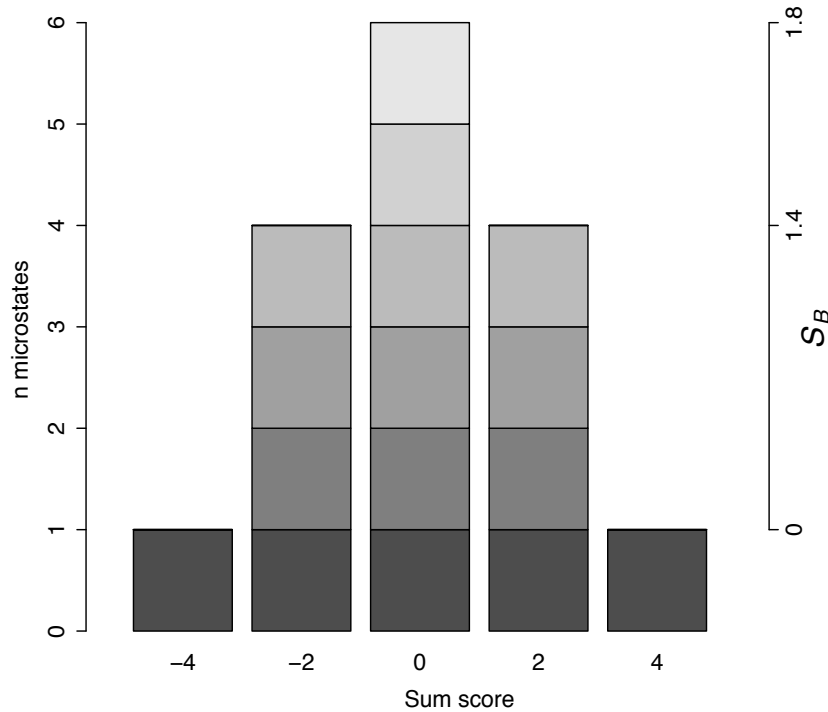
Total number of macrostates: 11

The AE Framework – Entropy

(a)

Boltzmann Entropy

$$S_B = \ln W \quad (1)$$

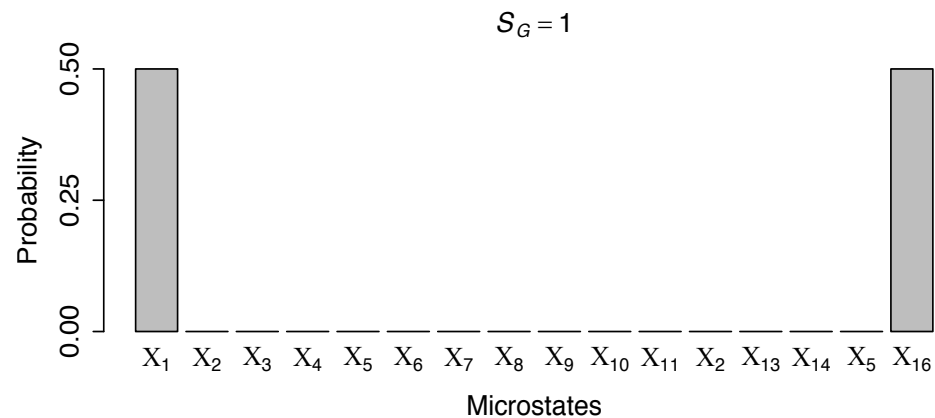
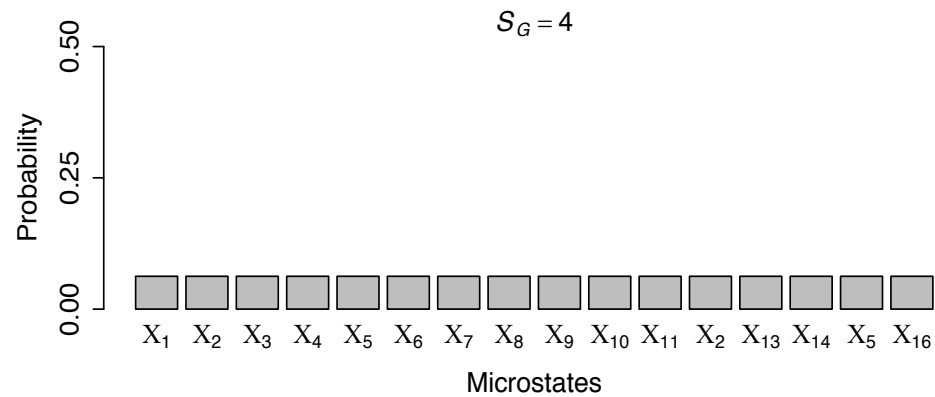


The AE Framework –Entropy

(b)

Gibbs Entropy

$$S_G = - \sum_X \text{Pr}(X) \log_2 \text{Pr}(X) \quad (2)$$



The AE Framework - Entropy

- **Proposition I.1:** Inconsistency of an attitude = Boltzmann entropy
- **Proposition I.2:** Attitude stability = Gibbs entropy

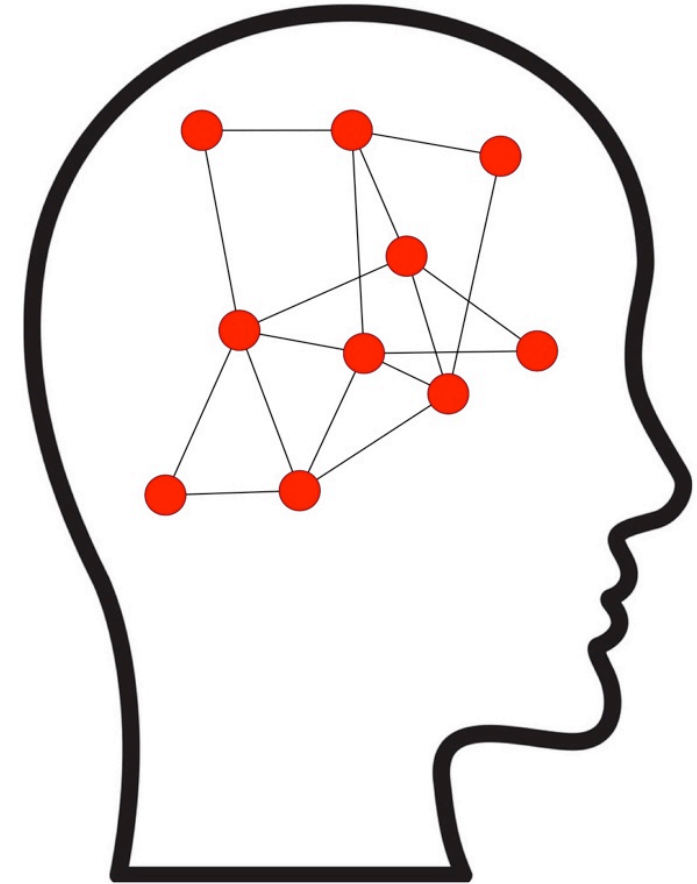
The AE Framework - Entropy

- 2nd law of thermodynamics: Entropy *always* increases



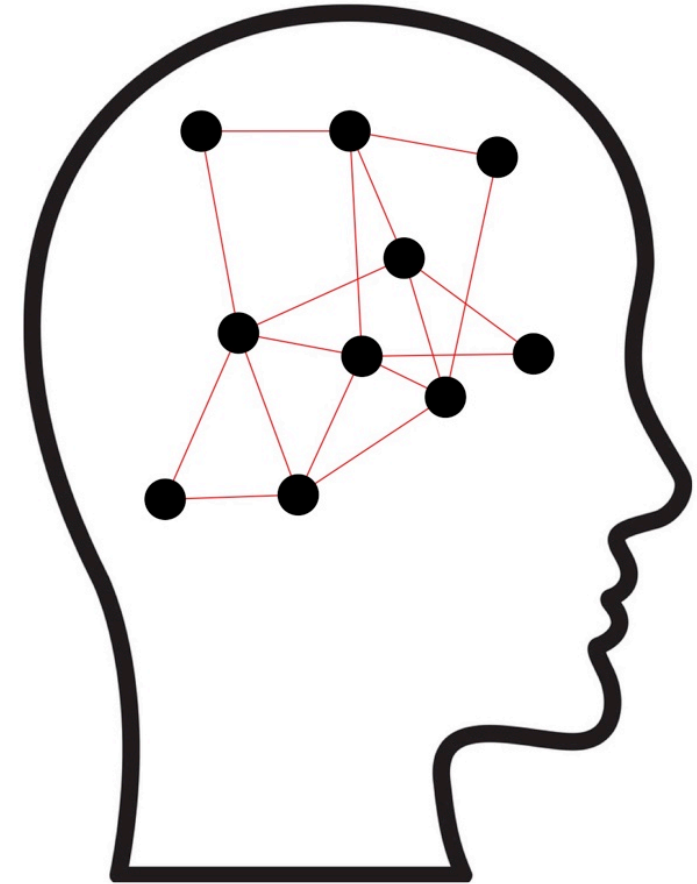
The AE Framework – Attitude Networks

- Attitude elements (beliefs, feelings, behaviors): Nodes



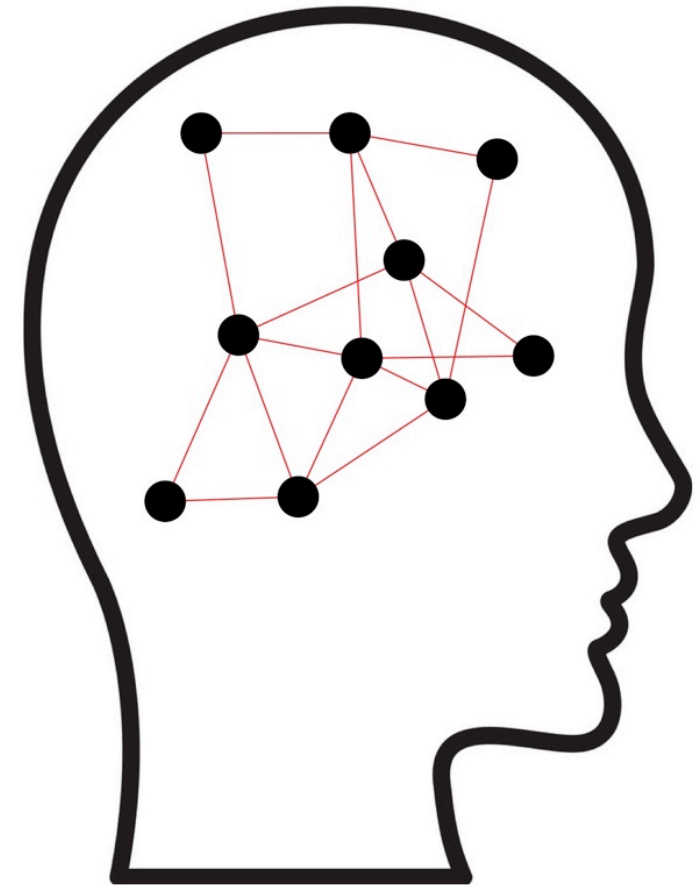
The AE Framework – Attitude Networks

- Attitude elements (beliefs, feelings, behaviors): Nodes
- Influence between attitude elements: Edges



The AE Framework: Attitudes as Networks

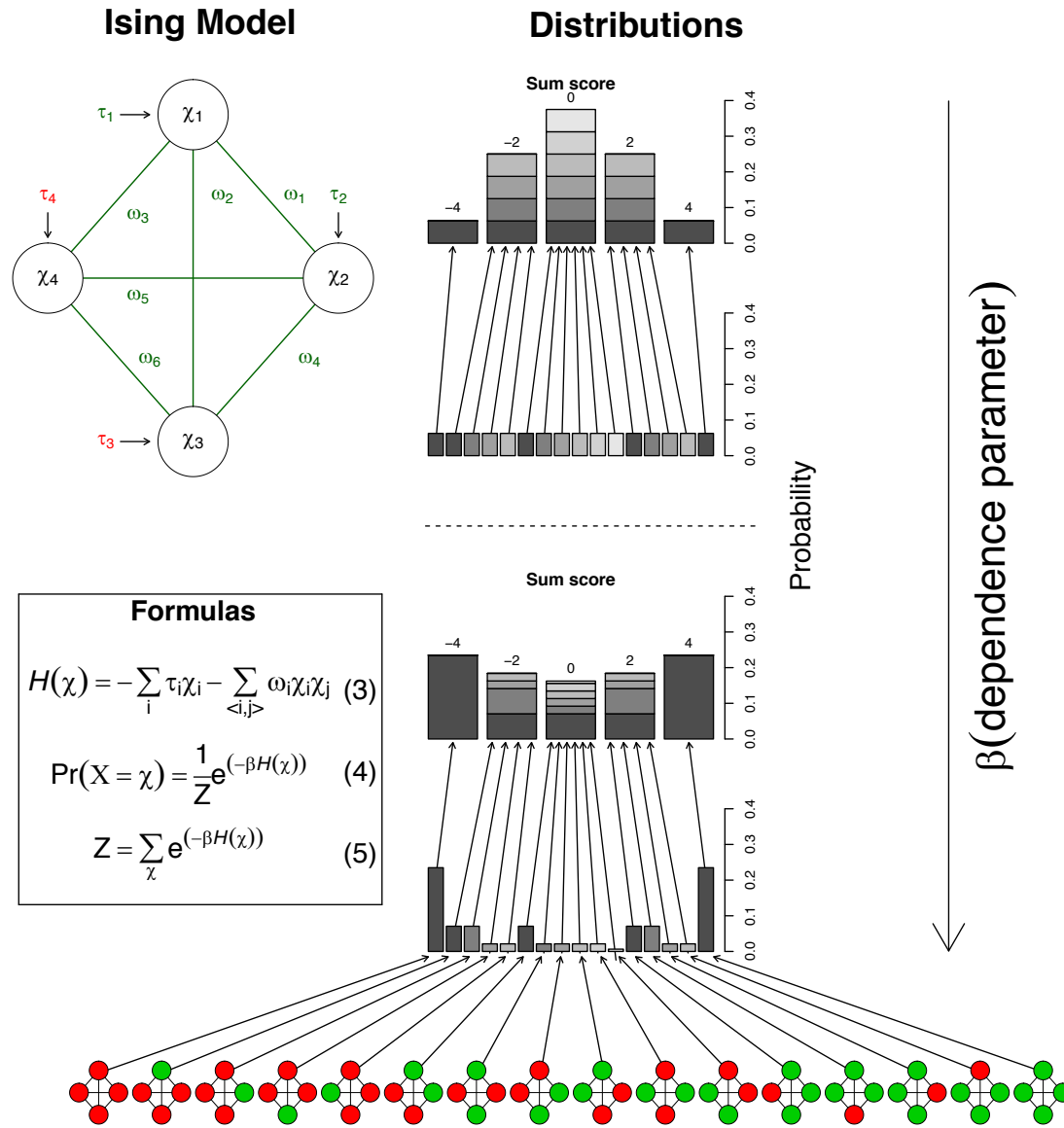
- Attitude elements (beliefs, feelings, behaviors): Nodes
- Influence between attitude elements: Edges
- Dynamics based on the Ising (1925) model



Dalege, J. *et al. Psychol. Rev.* **123**, 2–22 (2016).

Ising, E. Z. *Phys.* **31**, 253–258 (1925).

The AE Framework – Ising Model



The AE Framework – Proposition II & III

- **Proposition II:**

- Energy = local processing possibility to evaluate global entropy of an attitude
- Opposite state has lower energy = attitude element is likely to change

- **Proposition III:**

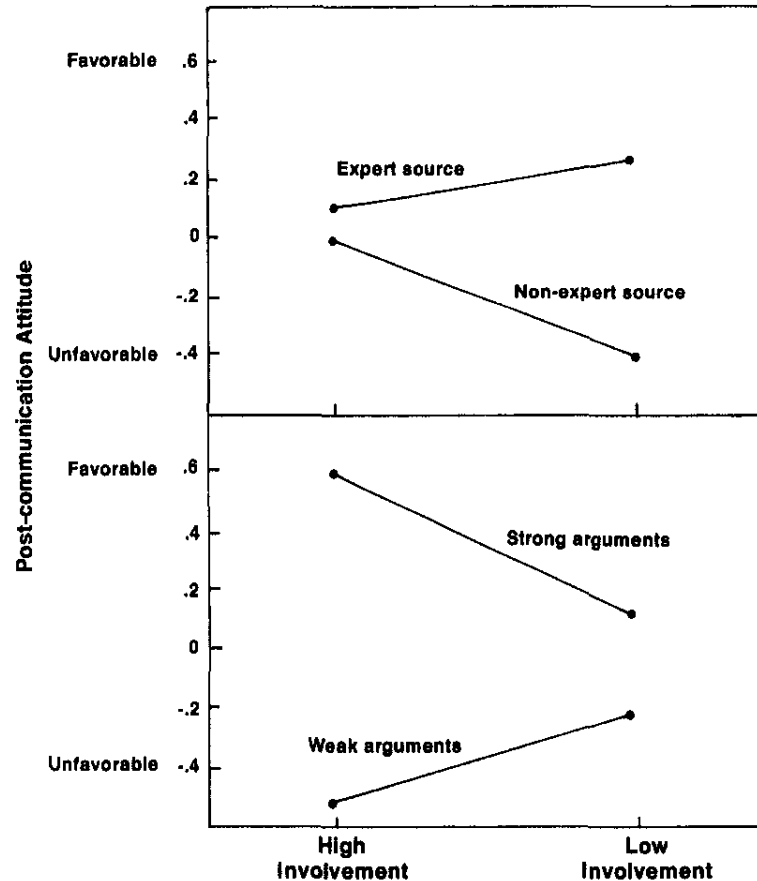
- Attention & thought -> higher dependence -> lower Gibbs entropy

Levels of Attitudinal Entropy Reduction

- Initial:
 - Attention
 - Brief thought
- Moderate:
 - Some elaboration
 - Commitment to an evaluation
 - Relevance to a decision
- High
 - Attitude importance (e.g., Howe & Krosnick, 2017)
 - Self-interest
 - Values
 - Social identification



An Example: Systematic Vs. Heuristic Processing

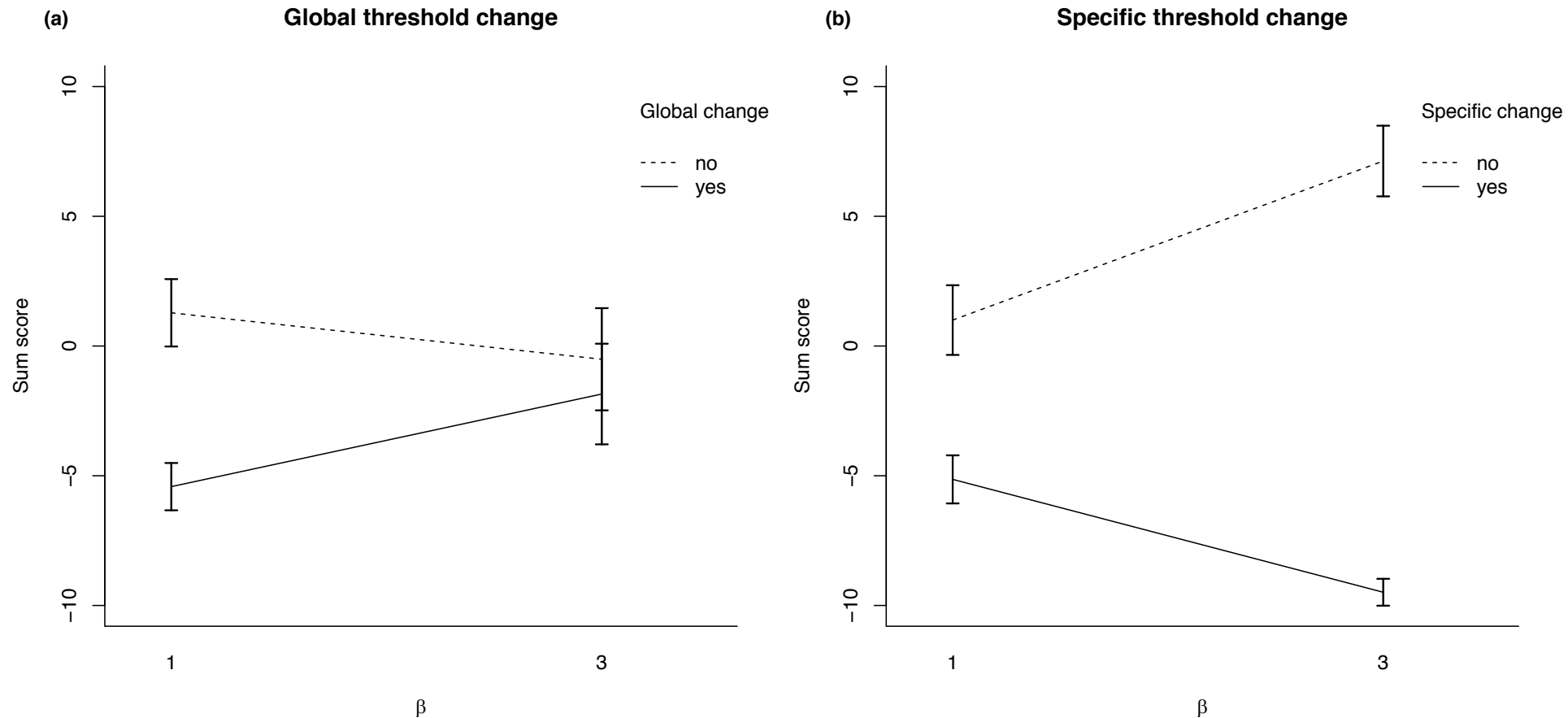


- High involvement -> Argument quality
- Low involvement -> Heuristic cues

Simulation Setup: Systematic Vs. Heuristic Processing

- High involvement: high β (3)
- Low involvement: low β (1)
- Heuristic persuasion: Moderate impact on all thresholds
- Systematic persuasion: Strong impact on specific thresholds
- 600 simulated individuals
- Initial thresholds positive
- Dependent variable: Sum score

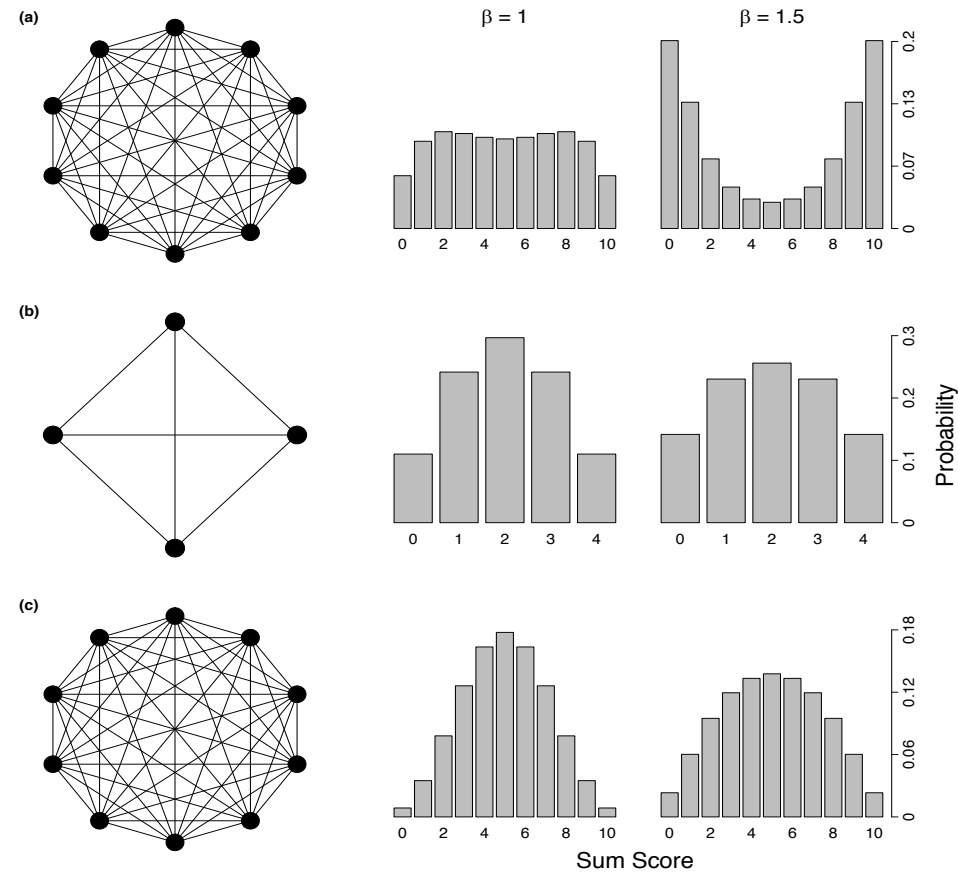
Simulation Results: Systematic Vs. Heuristic Processing



Three-way interaction: $F(1, 792) = 16.40, p = .001, \eta_p^2 = .02$

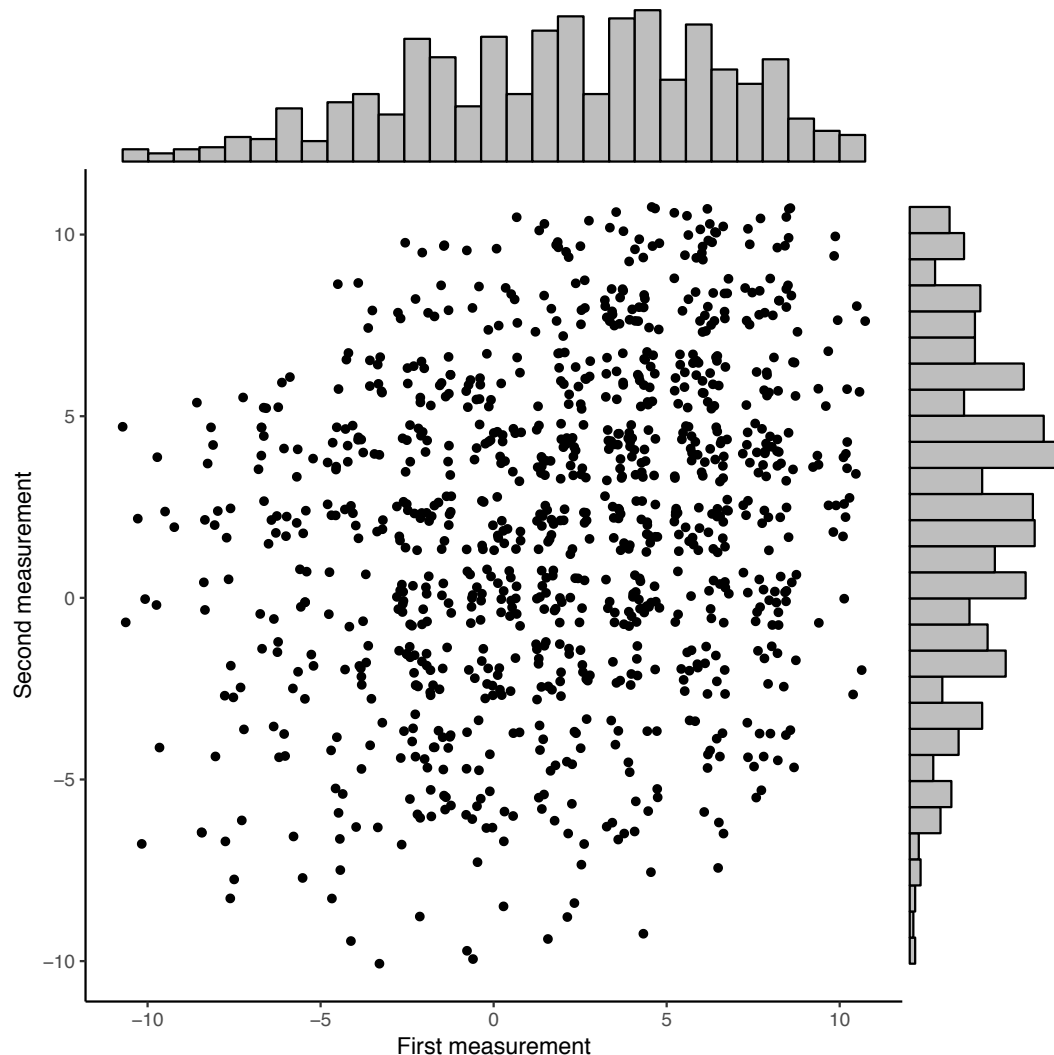
Other effects that follow
from the AE framework...

Mere Thought Effect



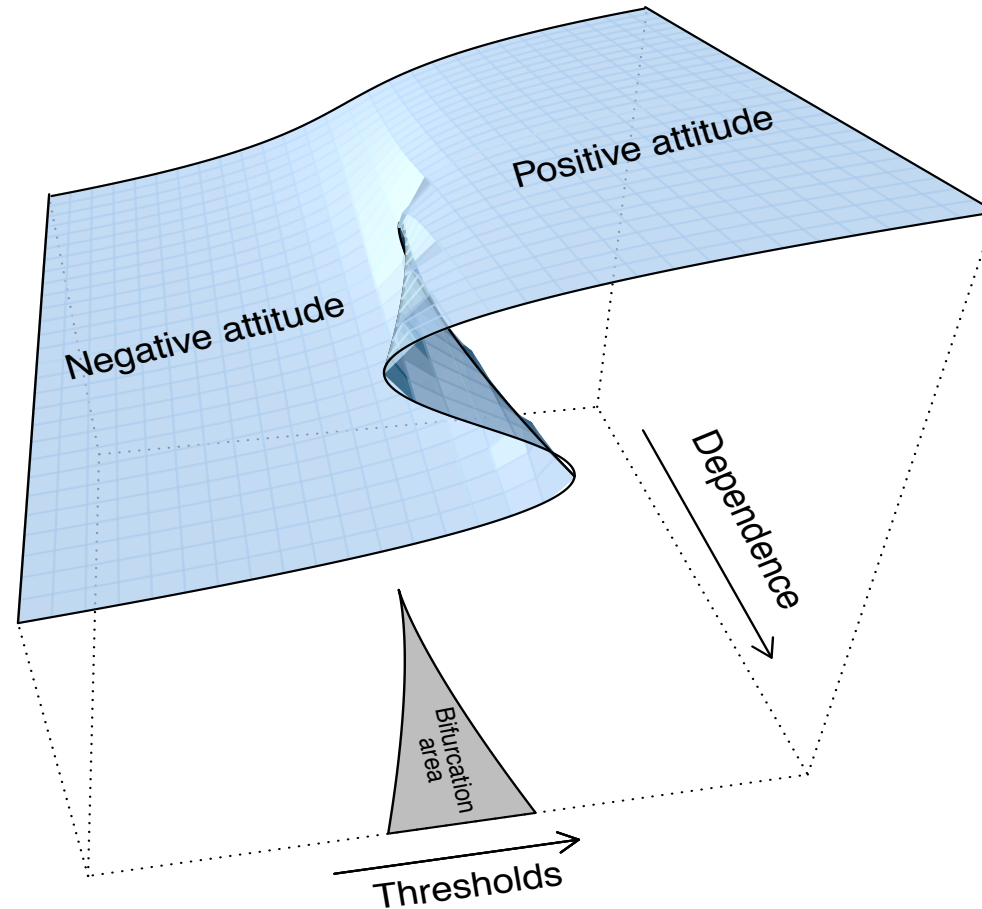
Tesser, A., Martin, L. & Mendola, M. In *Attitude strength: Antecedents and Consequences* (eds. Petty, R. E. & Krosnick, J. A.) 73–92 (Lawrence Erlbaum, Hillsdale, 1995).

(In)stability of Implicit Measures



- Low correlation
 - $r = .24, p < .001$
- Means virtually the same:
 - First measurement: 1.91
 - Second measurement: 2.04
 - $t(999) = 0.71, p = .479$
- Substantial variation
 - First measurement: $\sigma = 4.55$
 - Second measurement: $\sigma = 4.45$

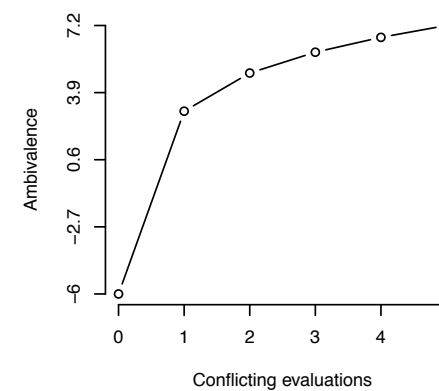
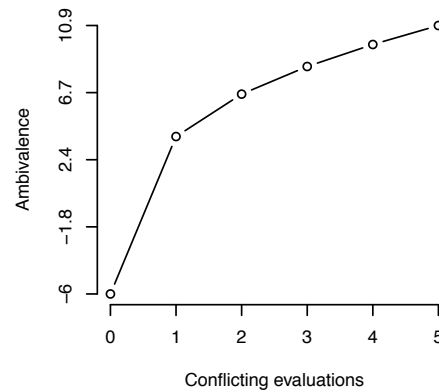
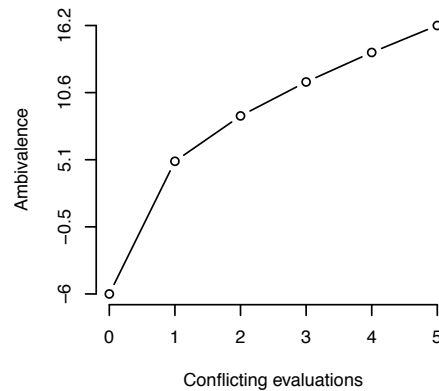
Attitude Strength



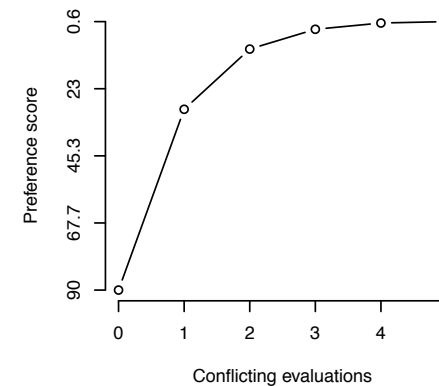
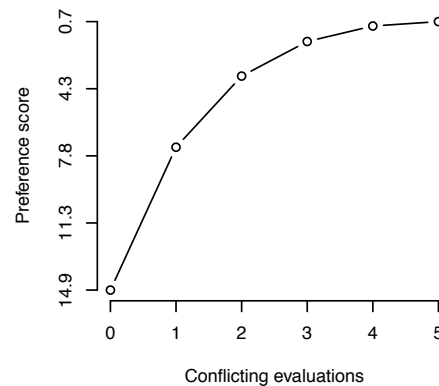
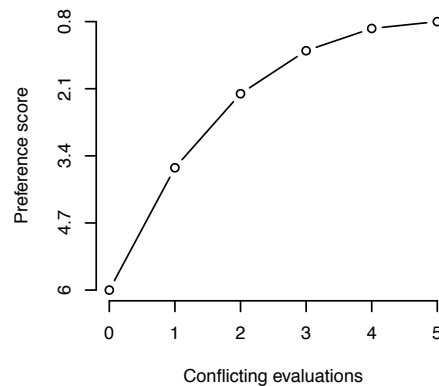
Krosnick, J. A. & Petty, R. E. In *Attitude strength: Antecedents and Consequences* (eds. Petty, R. E. & Krosnick, J. A.) 1–24 (Lawrence Erlbaum, Hillsdale, 1995).

The Gradual Threshold Model of Ambivalence

GT model



AE Framework



Main article:

Dalege, J., Borsboom, D., van Harreveld, F., & van der Maas, H. L. J. (2018). The Attitudinal Entropy (AE) framework as a general theory of individual attitudes. *Psychological Inquiry*, 29, 175-193.

Reply to commentaries:

Dalege, J., Borsboom, D., van Harreveld, F., Lunansky, G., & van der Maas, H. L. J. (2018). The Attitudinal Entropy (AE) framework: Clarifications, extensions, and future directions. *Psychological Inquiry*, 29, 218-228.

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Thank you!

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