Formalizing and Comparing Psychologically Plausible Models of Multiattribute Decisions

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Probabilistic Inferences

- Many decisions are based on probabilistic cues
- Example: „Which stock will yield a higher return?"
- Core question of interest: How do people integrate multiple sources of information?

	Option A	Option B
Cue 1	+	+
Cue 2	+	−
Cue 3	−	+
Cue 4	+	−

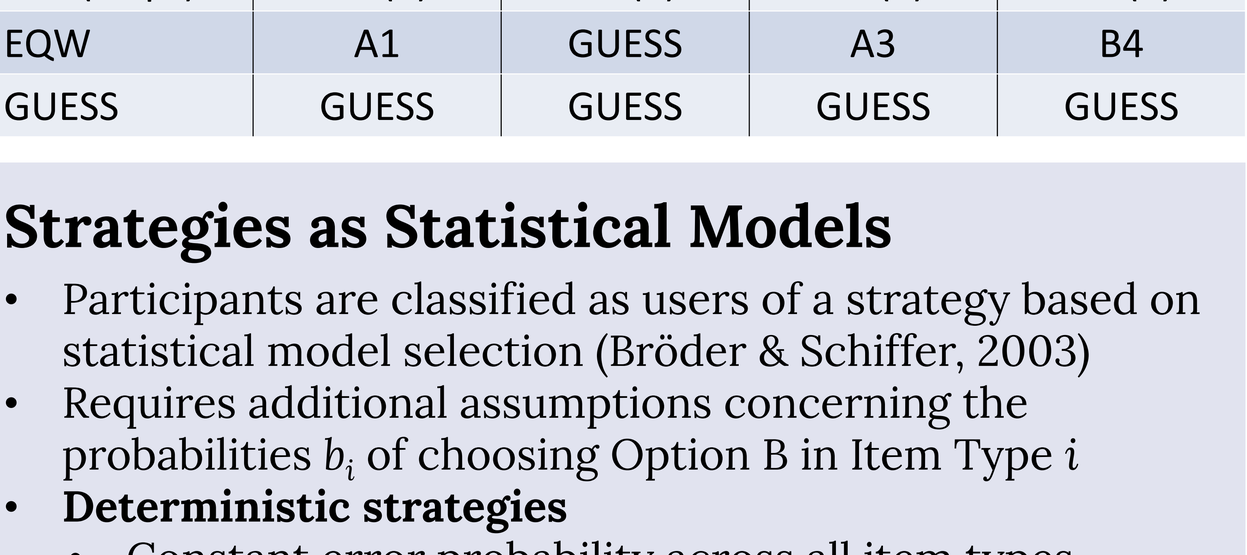
Strategy Predictions

- Decision strategies predict different choice patterns depending on cue values and cue validity v
- TTB also predicts the number of elementary processing steps that are necessary to make a decision
- WADD predicts the odds in favor of the preferred option

	Type 1		Type 2		Type 3		Type 4	
Cue validity	**A1**	**B1**	**A2**	**B2**	**A3**	**B3**	**A4**	**B4**
v = .90	−	−	+	−	−	−	+	−
v = .80	+	−	−	+	+	+	−	+
v = .70	+	−	−	−	+	+	−	+
v = .60	−	−	+	+	+	−	−	−
Strategy Predictions								
WADD (odds)	A1 (2.23)		A2 (0.81)		A3 (0.41)		B4 (0.04)	
TTB (steps)	A1 (2)		A2 (1)		A3 (4)		A4 (1)	
EQW	A1		GUESS		A3		B4	
GUESS	GUESS		GUESS		GUESS		GUESS	

Strategies as Statistical Models

- Participants are classified as users of a strategy based on statistical model selection (Bröder & Schiffer, 2003)
- Requires additional assumptions concerning the probabilities b_i of choosing Option B in Item Type i
- **Deterministic strategies**
  - Constant error probability across all item types
- **Probabilistic strategies**
  - Order-constrained probabilities across item types
  - TTBprob: Higher choice variability for item types that require more elementary processing steps
  - WADDprob: Higher choice variability for item types with smaller odds in favor of preferred option

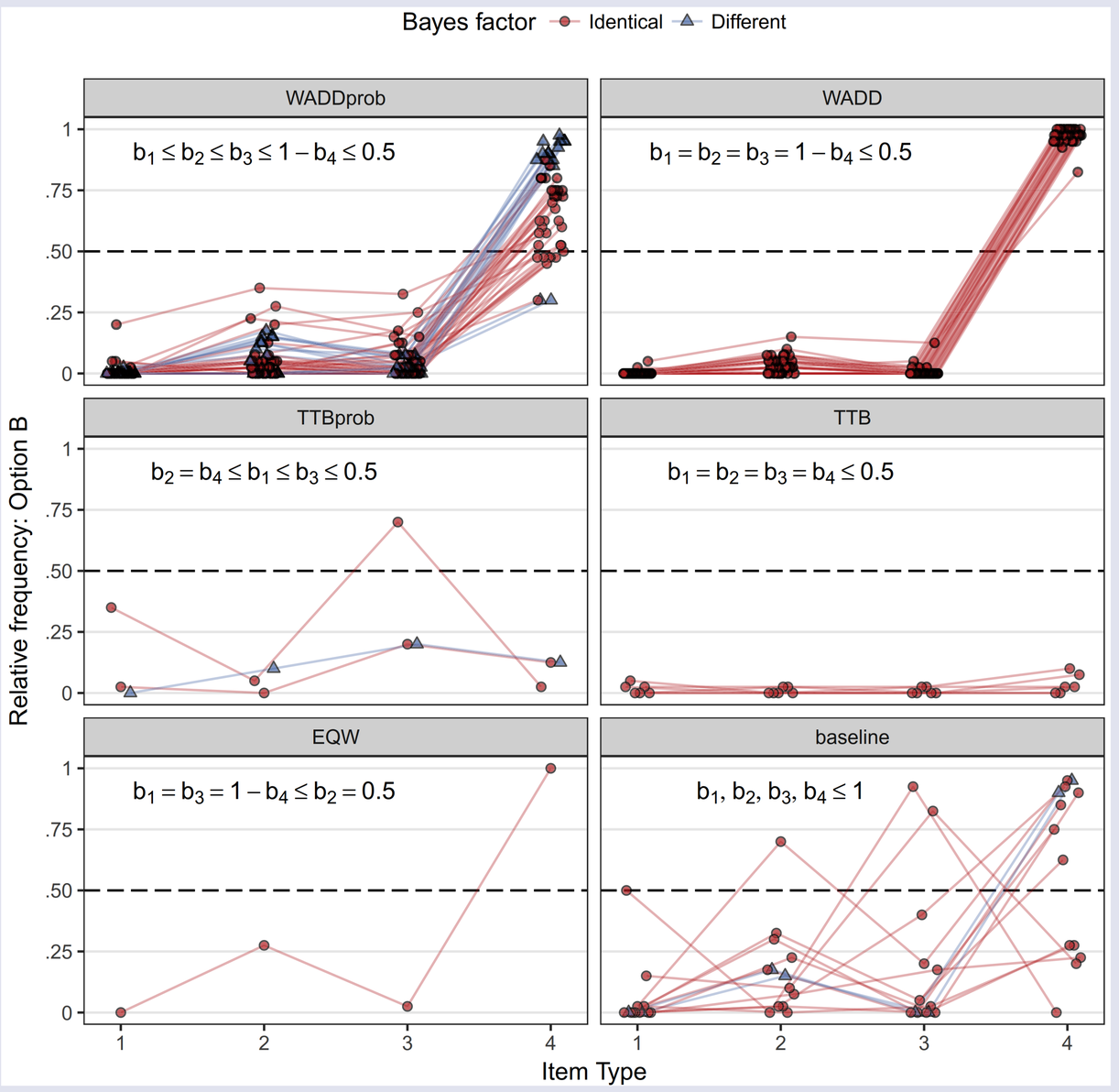


Model Selection Methods

- Normalized maximum likelihood (NML): Select strategy that provides shortest description of the data and generalizes best to new data (Hilbig & Moshagen, 2014)
- Bayes factor (BF): Select strategy with the highest posterior model probability given the data (Lee, 2016)

Empirical Results

- 104 participants completed 40 trials per item type (simulated recovery rates > 90% for each strategy)
- Most participants were classified as users of WADD (NML: 46%; BF: 32%) or WADDprob (NML: 32%; BF: 46%)
- Deterministic version of TTB more often selected than probabilistic TTB (NML: 7% vs. 2%; BF: 6% vs. 3%)



Discussion

- Importance of specifying an error theory
- Evidence against a specific TTB mechanism (more steps result in more errors) in inferences from givens
- NML and the BF result in similar classification results (NML favors probabilistic strategies more strongly)

References

- Bröder, A., & Schiffer, S. (2003). Bayesian strategy assessment in multi-attribute decision making. *Journal of Behavioral Decision Making*, 16, 193–213.
- Hilbig, B. E., & Moshagen, M. (2014). Generalized outcome-based strategy classification: Comparing deterministic and probabilistic choice models. *Psychonomic Bulletin & Review*, 21, 1431–1443.
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