Society for Judgment and Decision Making

University of Zurich[UZH]

Modeling the influence of perceived situational uncertainty on everyday risky choices

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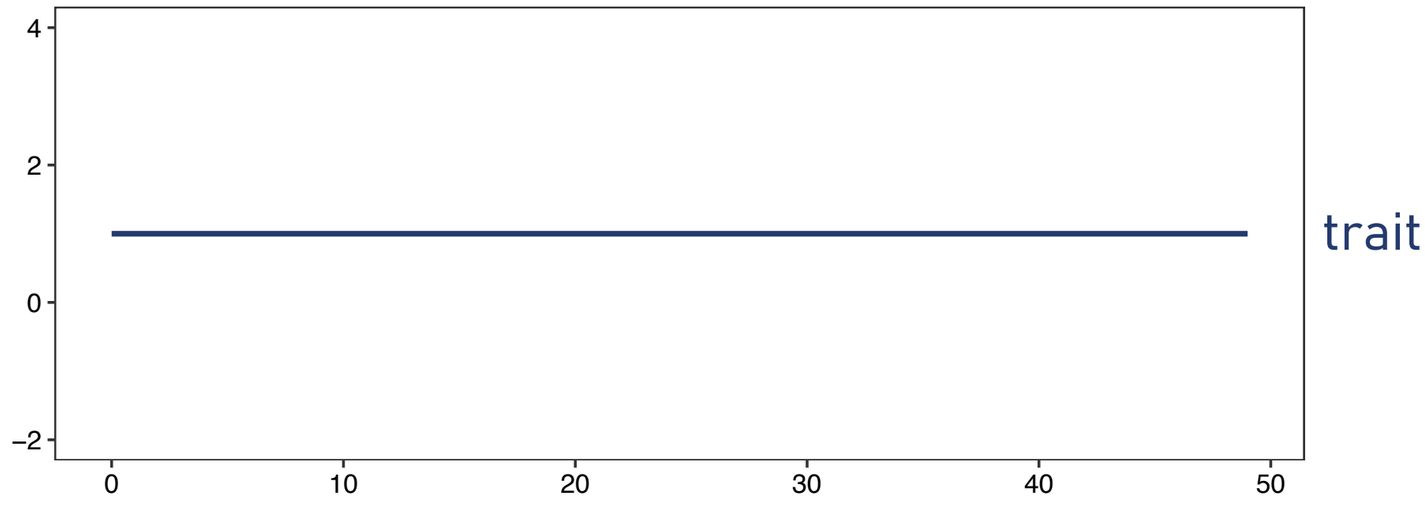
Risky choices

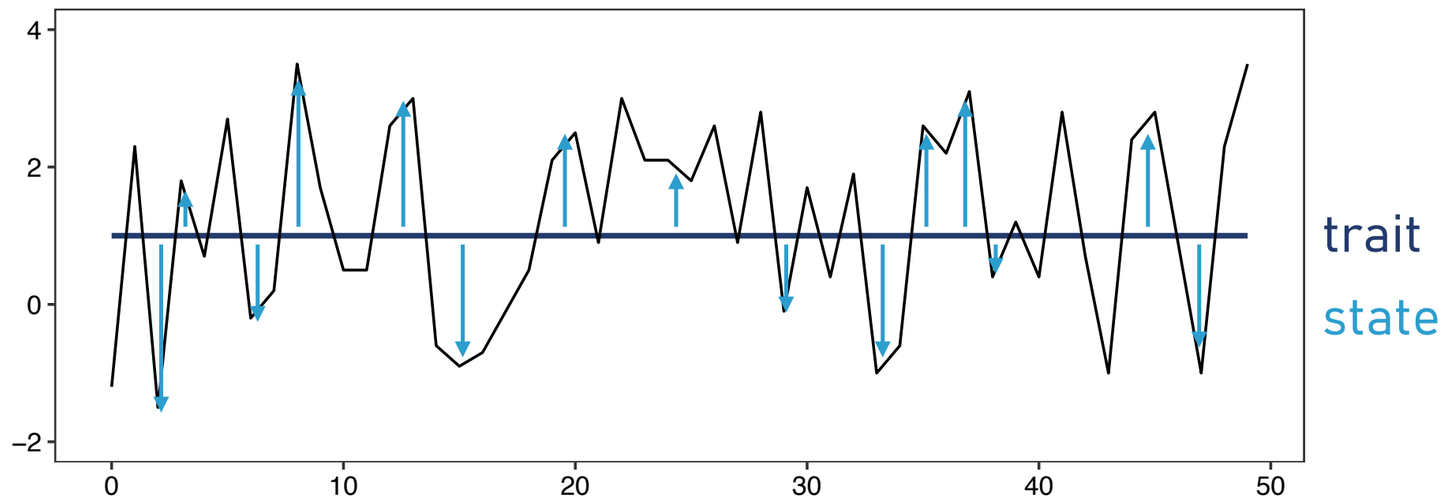
Risk preference

(Frey et al., 2017; Schildberg-Hörisch, 2018; Weber & Milliman, 1997; Yechiam & Ert, 2011)

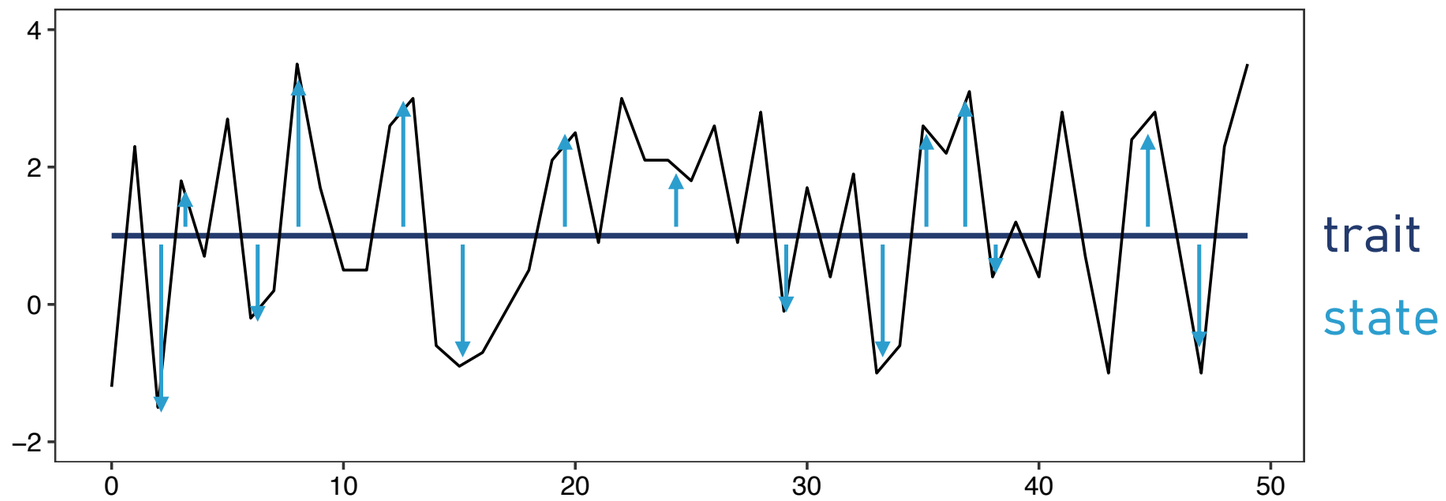


Integrated trait-state model

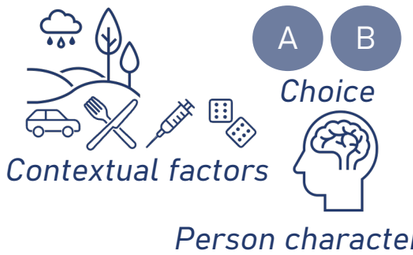
(Hamaker et al., 2007)



RQ1: To what extent is there **situational variability** in (everyday) risky choices?



Psychological processes



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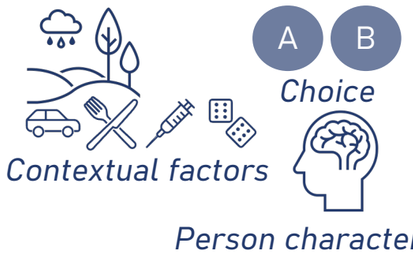

Risk as Feelings

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Emotion-Based Choice

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PROSPECT THEORY: AN ANALYSIS OF DECISION UNDER RISK

BY DANIEL KAHNEMAN AND AMOS TVERSKY[1]

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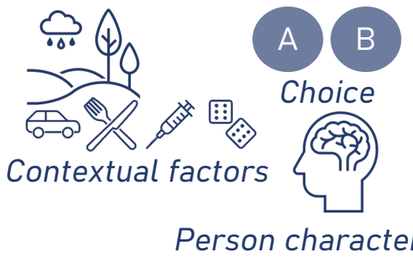

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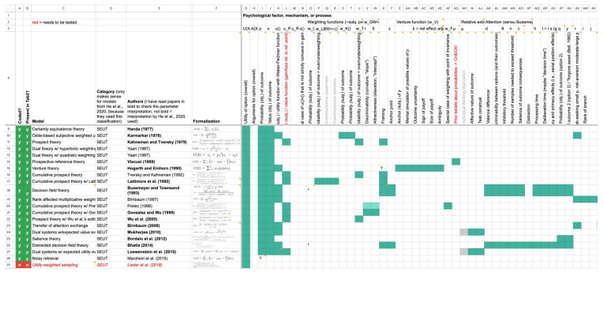

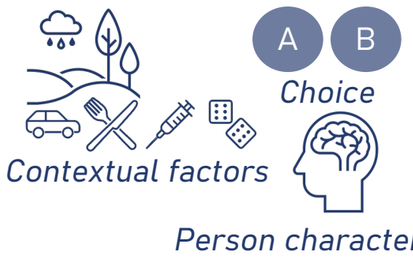

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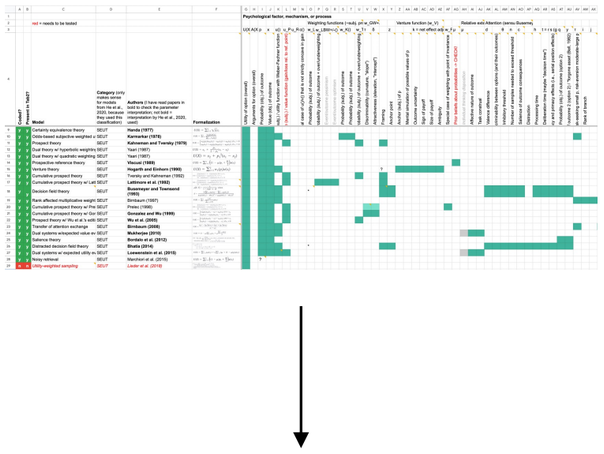
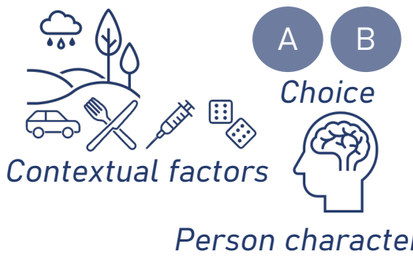


Perception of uncertainty
Aleatory vs. epistemic uncertainty

Fox & Ülkümen (2011), Hacking (1975), Tannenbaum et al. (2017), Ülkümen et al. (2016)



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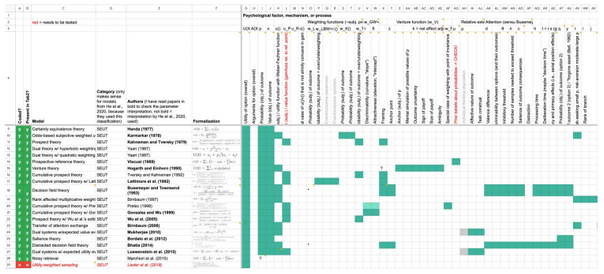
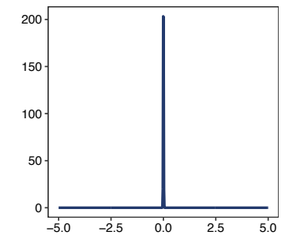
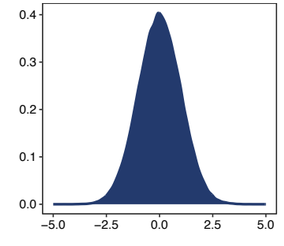


Aleatory uncertainty

low

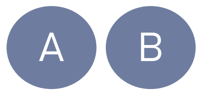


high



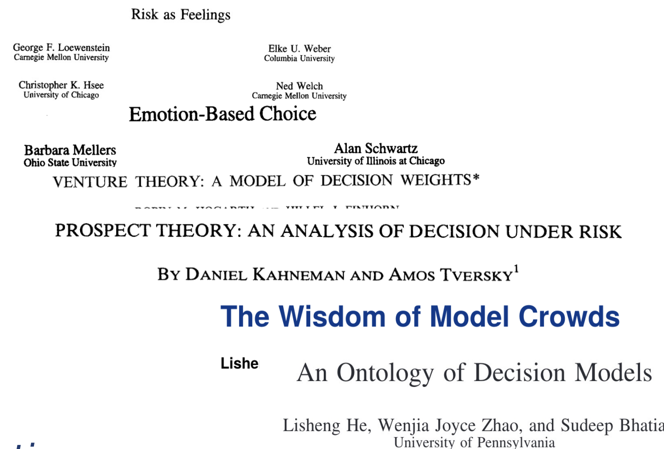
Fox & Ülkümen (2011), Hacking (1975), Tannenbaum et al. (2017), Ülkümen et al. (2016)

Contextual factors



Choice

Person characteristics



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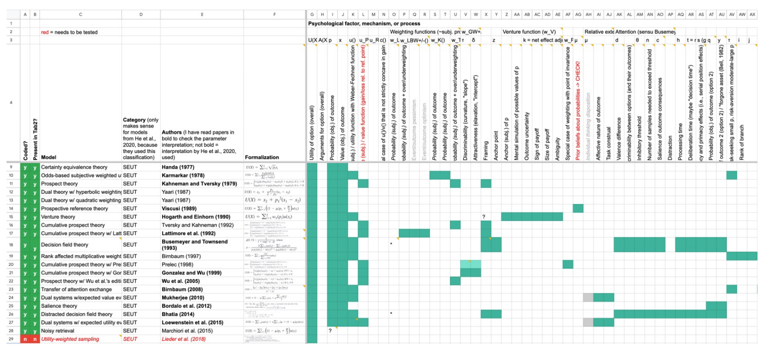
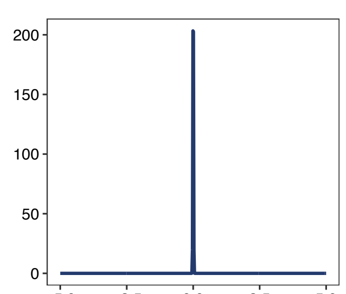


red = needs to be tested

Psychological factor, mechanism, or process

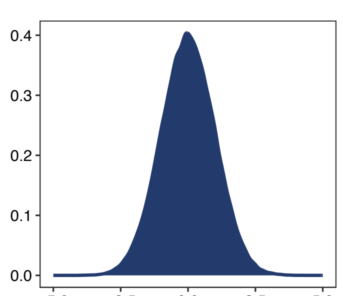
	Coded?	Present in Tab2?	Model	Category (only makes sense for models from He et al., 2020, because they used this classification)	Authors (I have read papers in bold to check the parameter interpretation; not bold = interpretation by He et al., 2020, used)
9	y	y	Certainty equivalence theory	SEUT	**Handa (1977)**
10	y	y	Odds-based subjective weighted u	SEUT	**Karmarkar (1978)**
11	y	y	Prospect theory	SEUT	**Kahneman and Tversky (1979)**
12	y	y	Dual theory w/ hyperbolic weighting	SEUT	Yaari (1987)
13	y	y	Dual theory w/ quadratic weighting	SEUT	Yaari (1987)
14	y	y	Prospective reference theory	SEUT	**Viscusi (1989)**
15	y	y	Venture theory	SEUT	**Hogarth and Einhorn (1990)**
16	y	y	Cumulative prospect theory	SEUT	Tversky and Kahneman (1992)
17	y	y	Cumulative prospect theory w/ Latt	SEUT	**Lattimore et al. (1992)**
18	y	y	Decision field theory	SEUT	**Busemeyer and Townsend (1993)**
19	y	y	Rank affected multiplicative weight	SEUT	Birnbaum (1997)
20	y	y	Cumulative prospect theory w/ Pre	SEUT	Prelec (1998)
21	y	y	Cumulative prospect theory w/ Gor	SEUT	**Gonzalez and Wu (1999)**
22	y	y	Prospect theory w/ Wu et al.'s editi	SEUT	**Wu et al. (2005)**
23	y	y	Transfer of attention exchange	SEUT	**Birnbaum (2008)**
24	y	y	Dual systems w/expected value ev	SEUT	**Mukherjee (2010)**
25	y	y	Salience theory	SEUT	**Bordalo et al. (2012)**
26	y	y	Distracted decision field theory	SEUT	**Bhatia (2014)**
27	y	y	Dual systems w/ expected utility ev	SEUT	**Loewenstein et al. (2015)**
28	y	y	Noisy retrieval	SEUT	Marchiori et al. (2015)
29	n	n	*Utility-weighted sampling*	*SEUT*	*Lieder et al. (2018)*

low

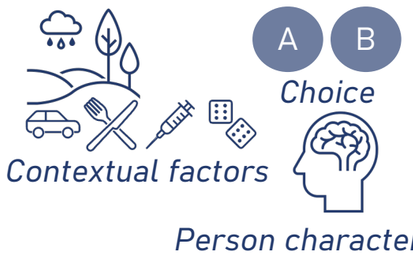


Aleatory uncertainty

high



Fox & Ülkümen (2011), Hacking (1975), Tannenbaum et al. (2017), Ülkümen et al. (2016)



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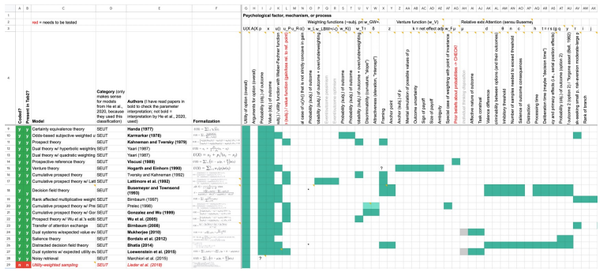
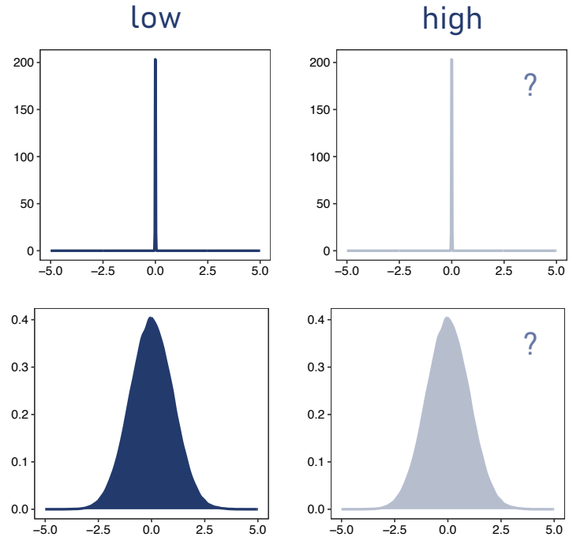


Epistemic uncertainty



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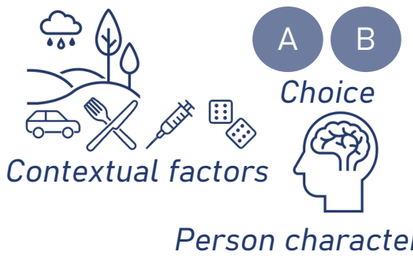

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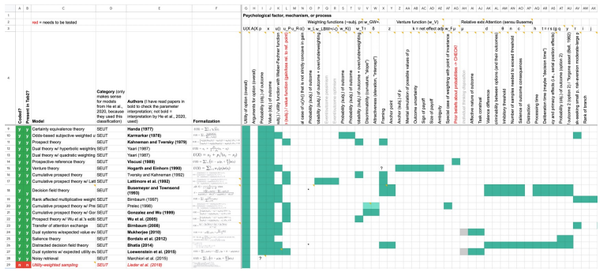

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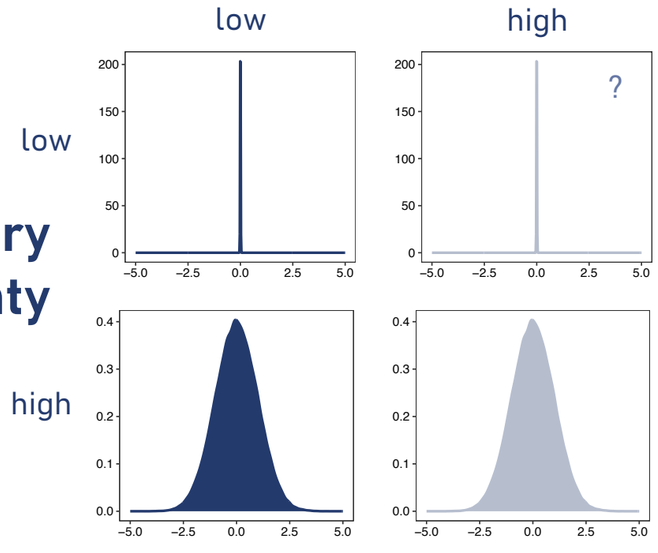

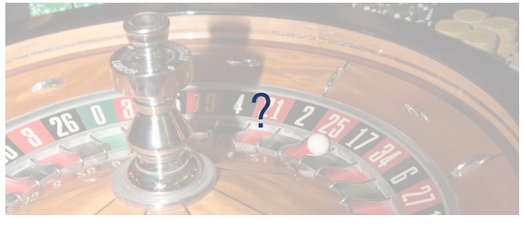

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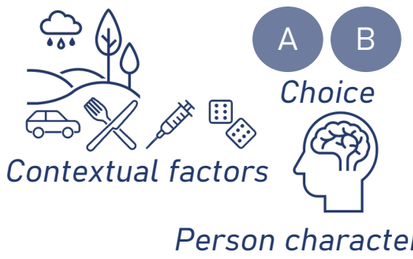

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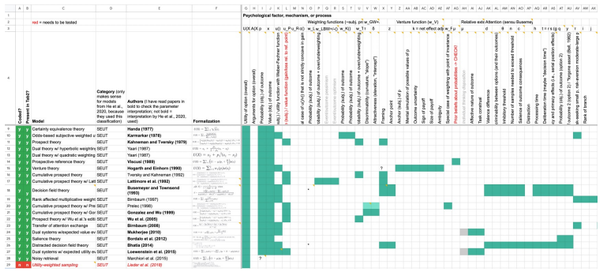

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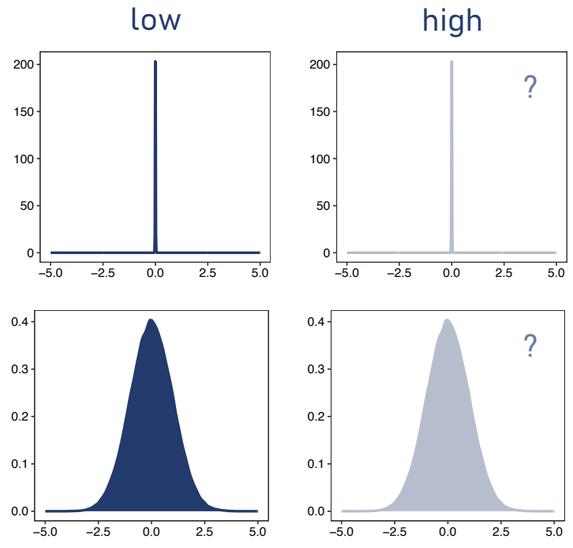
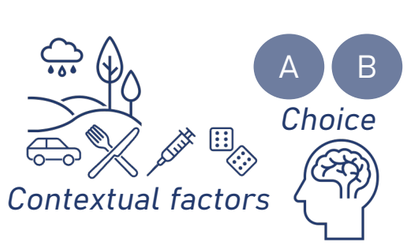


Epistemicness

Fox & Ülkümen (2011), Hacking (1975), Tannenbaum et al. (2017), Ülkümen et al. (2016)

RQ2: Is the **perception of epistemic uncertainty** related to a person's (everyday) risky choices?



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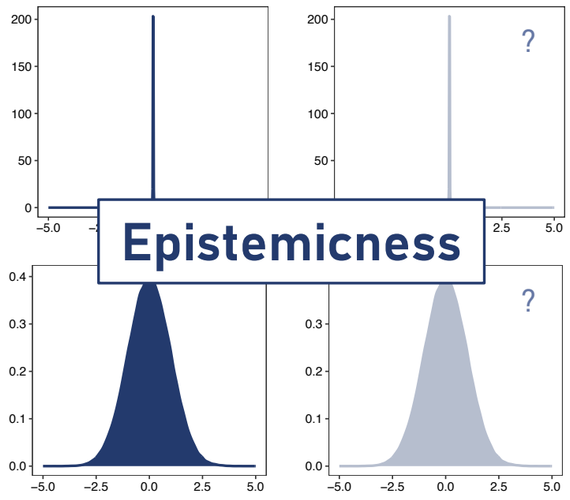

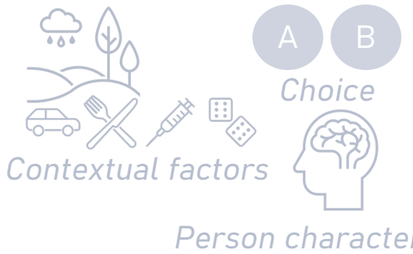

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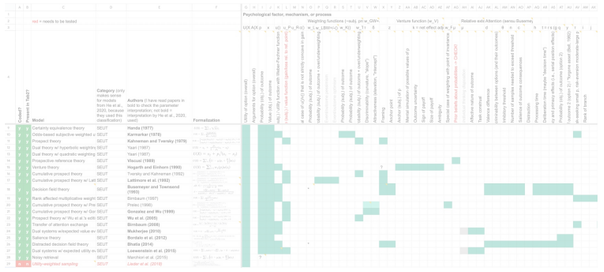
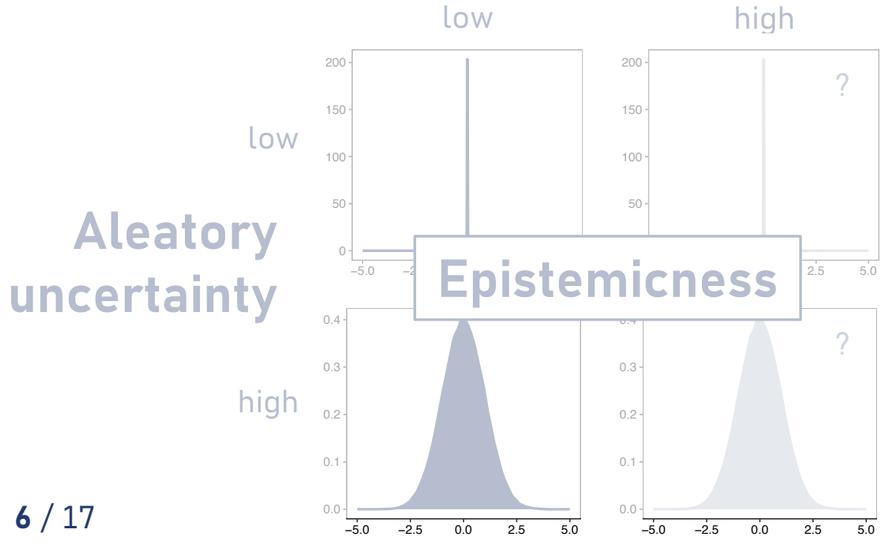
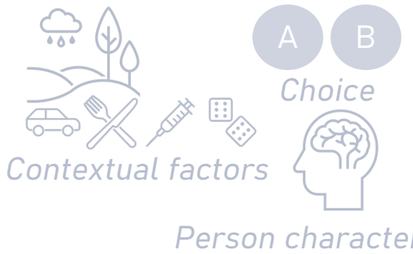


Measurement

Epistemic uncertainty





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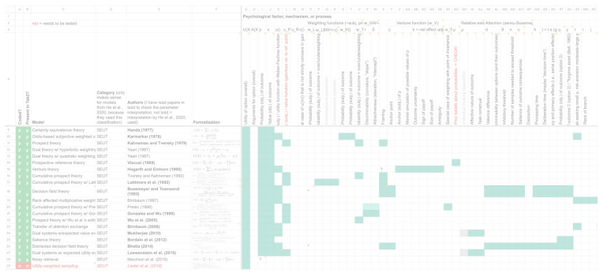

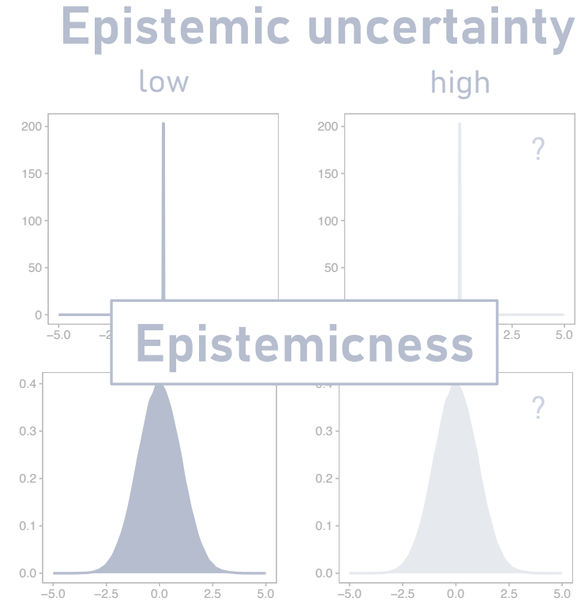

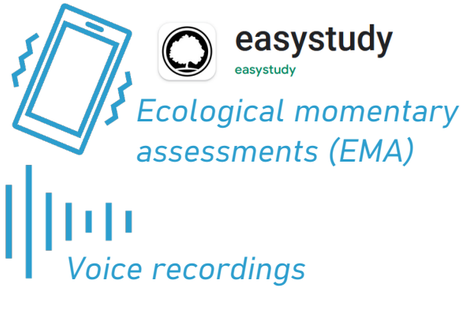

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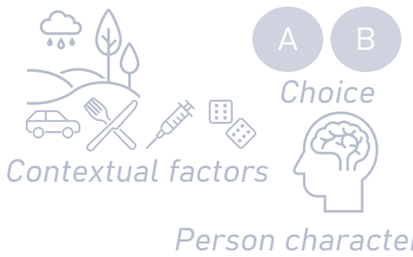

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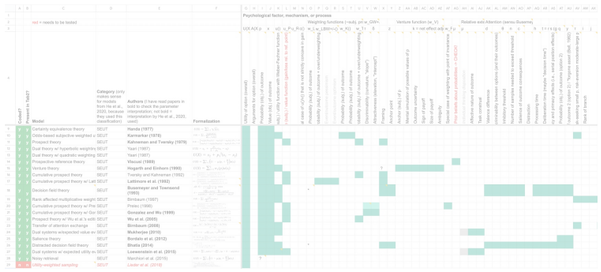
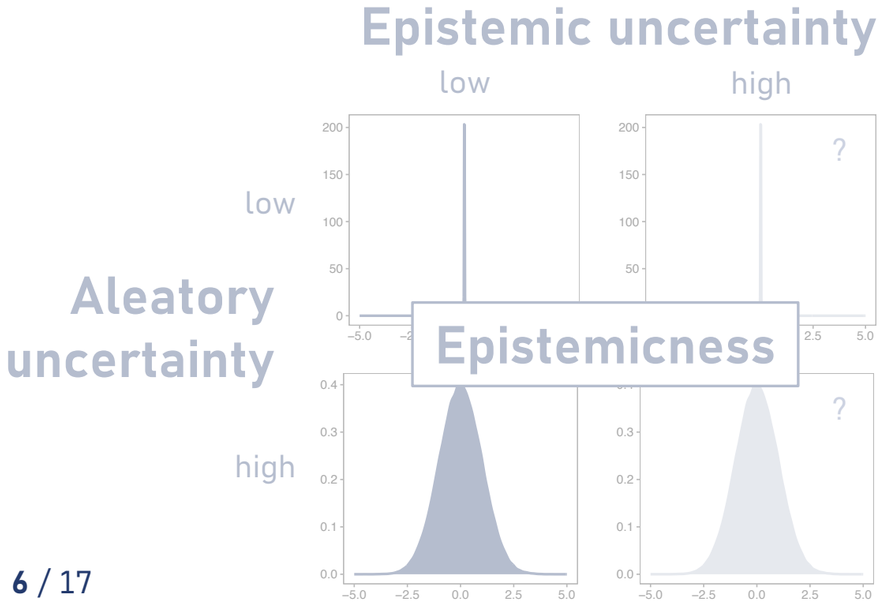
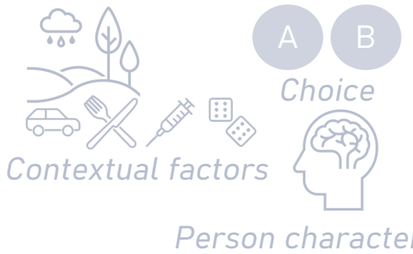




Measurement

Think aloud protocols

Ericsson & Simon (1983, 1990)



Risk as Feelings

George F. Loewenstein, Carnegie Mellon University
Elke U. Weber, Columbia University
Christopher K. Hsee, University of Chicago
Ned Welch, Carnegie Mellon University

Emotion-Based Choice

Barbara Mellers, Ohio State University
Alan Schwartz, University of Illinois at Chicago

VENTURE THEORY: A MODEL OF DECISION WEIGHTS*

PROSPECT THEORY: AN ANALYSIS OF DECISION UNDER RISK

BY DANIEL KAHNEMAN AND AMOS TVERSKY[1]

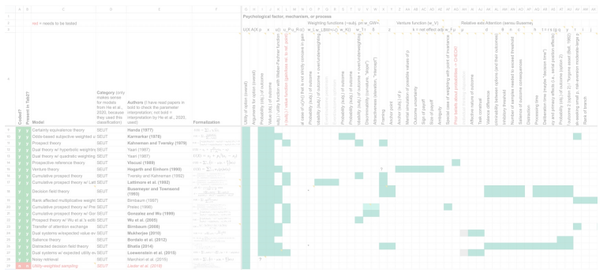
The Wisdom of Model Crowds

Lishe

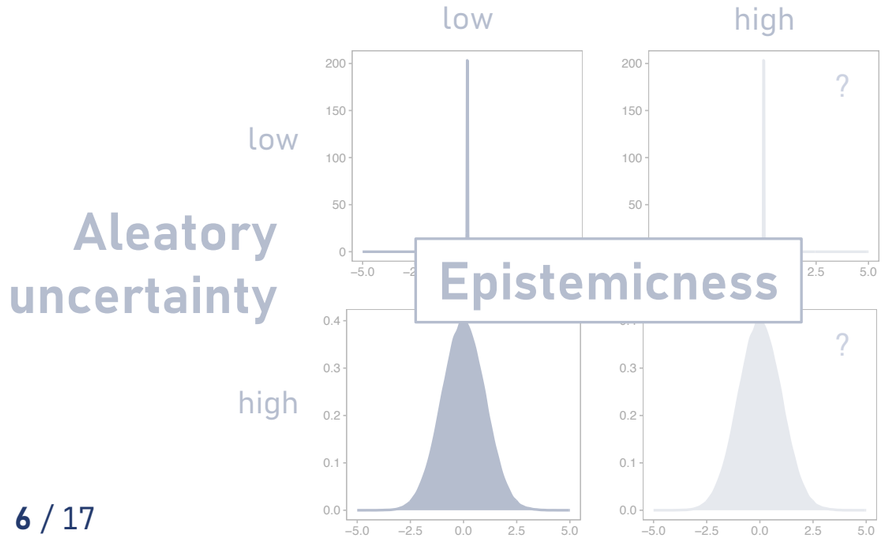
An Ontology of Decision Models

Lisheng He, Wenjia Joyce Zhao, and Sudeep Bhatia
University of Pennsylvania

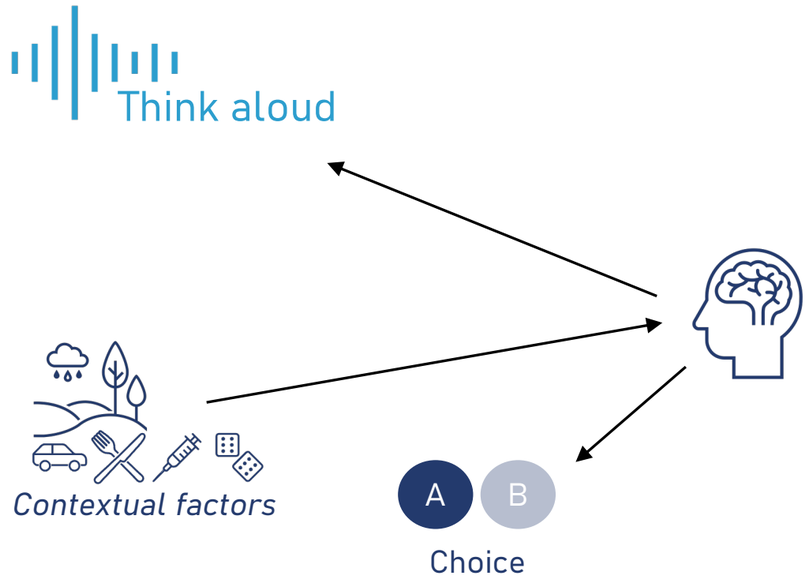
Psychological processes

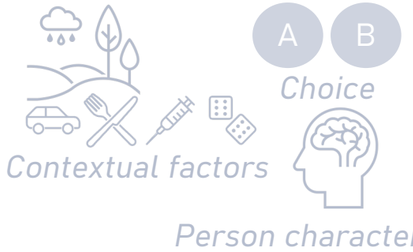


Epistemic uncertainty



Measurement





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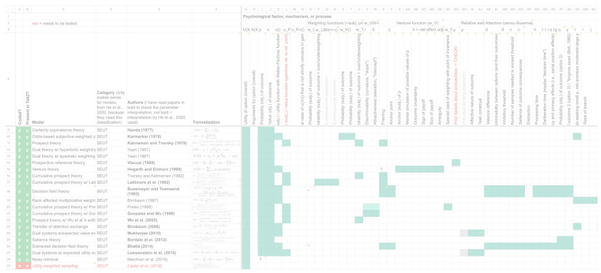
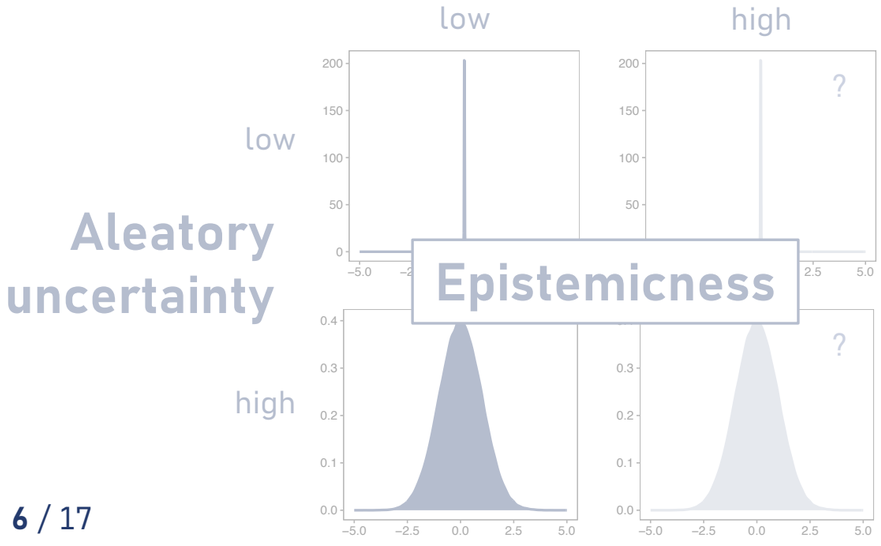


Epistemic uncertainty

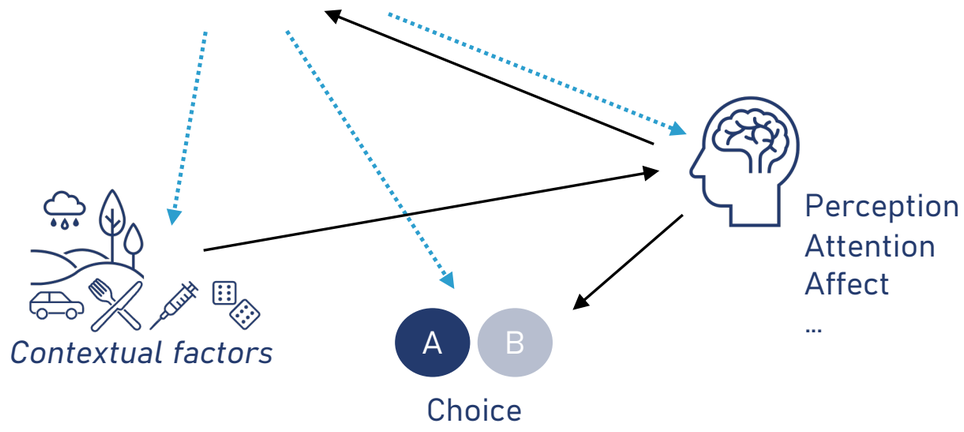


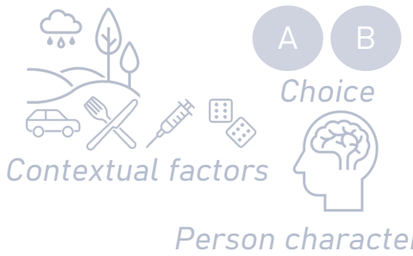
Self-report

Voice recordings

Measurement

Think aloud





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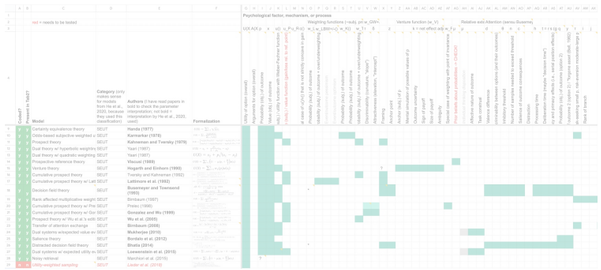
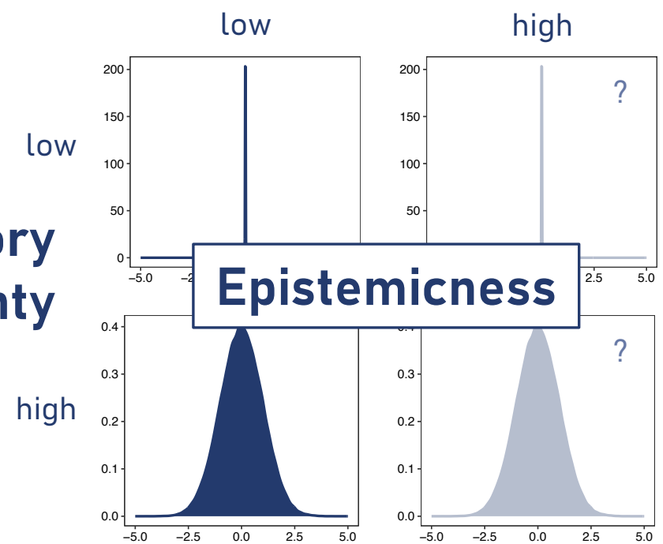


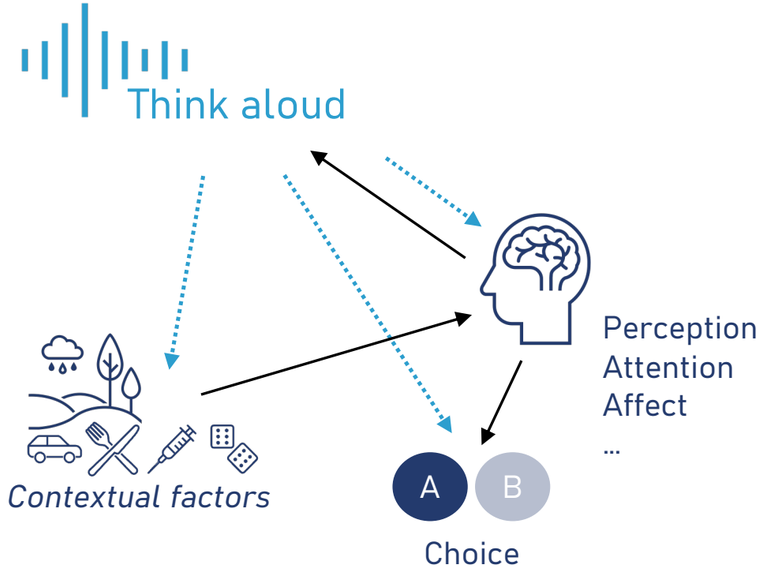
Epistemic uncertainty

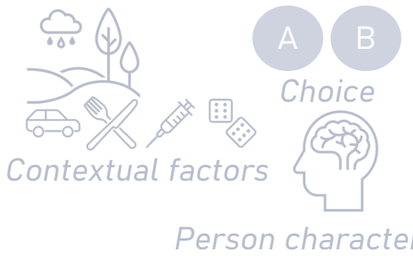


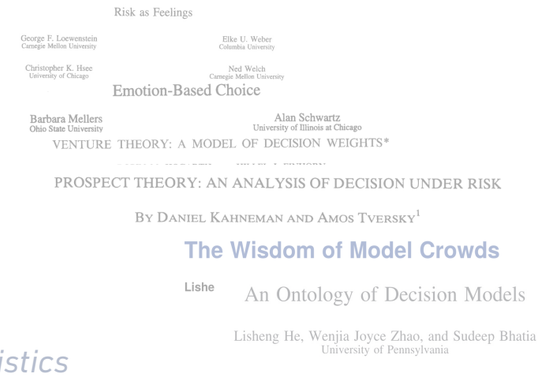
Linguistic markers of uncertainty perceptions

(Ülkümen et al., 2016; Tannenbaum et al., 2017)

Measurement



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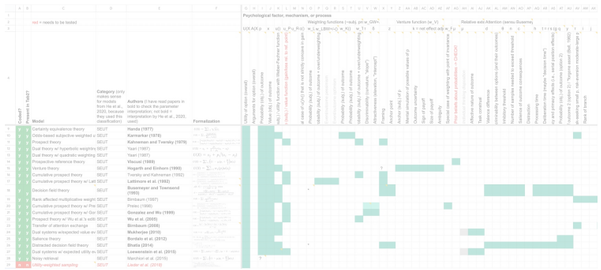

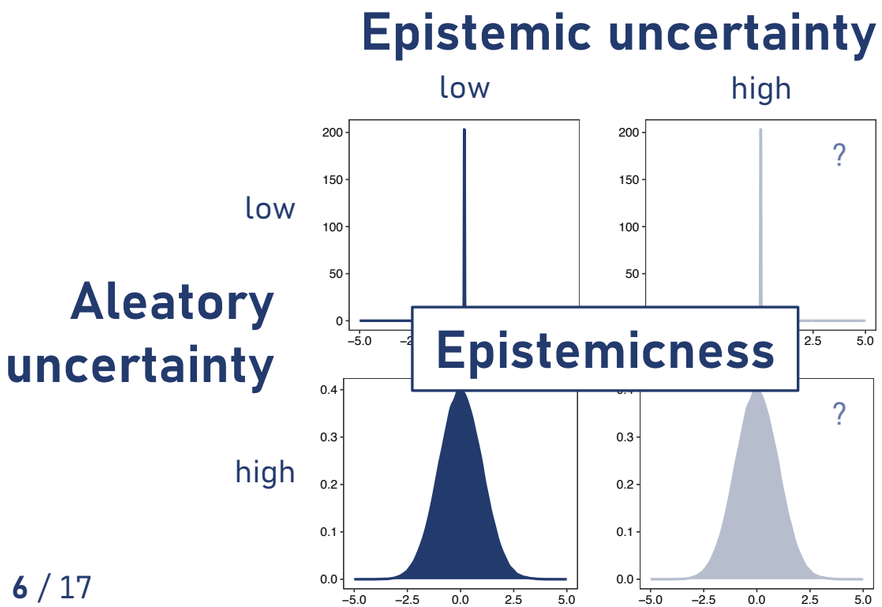

Linguistic markers of uncertainty perceptions
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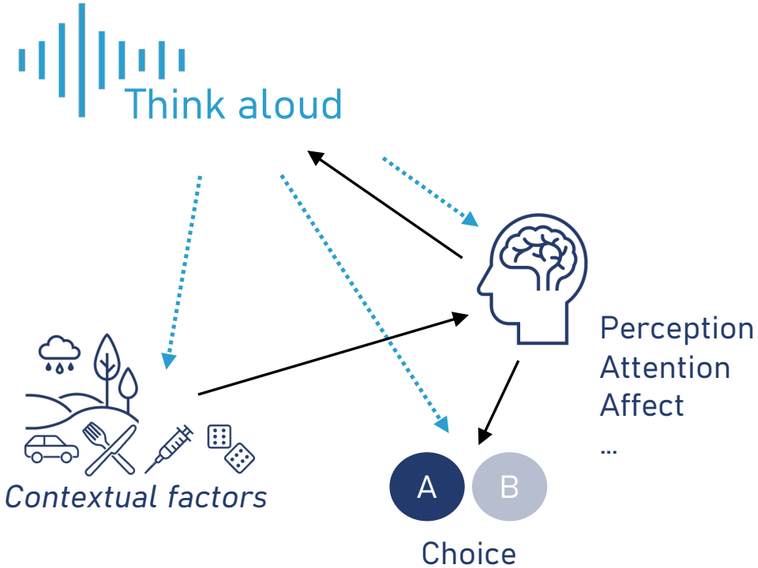
Likelihood statements:
"It is likely that"

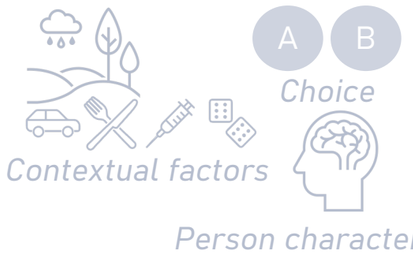

Self-report


Voice recordings

easystudy
easystudy
Ecological momentary assessments (EMA)

Measurement





Risk as Feelings

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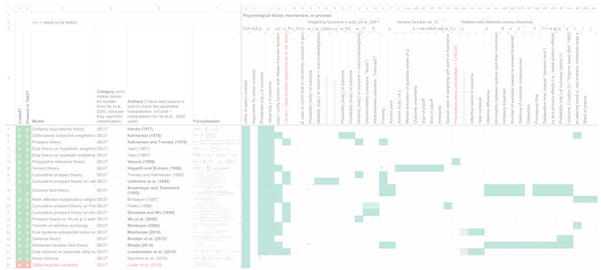
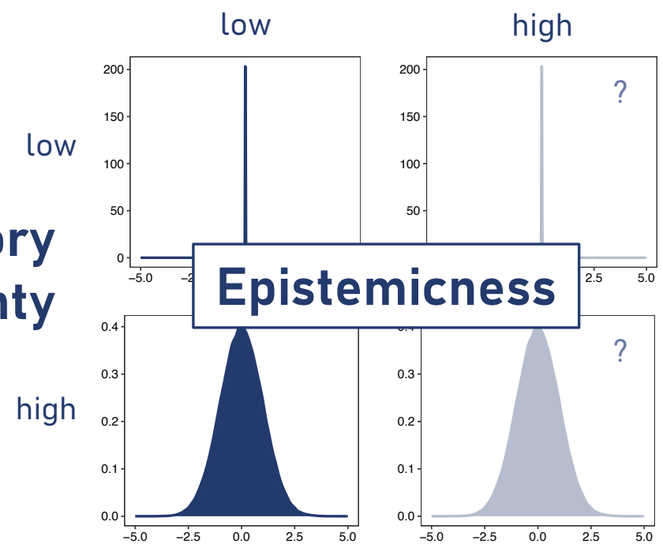


Epistemic uncertainty

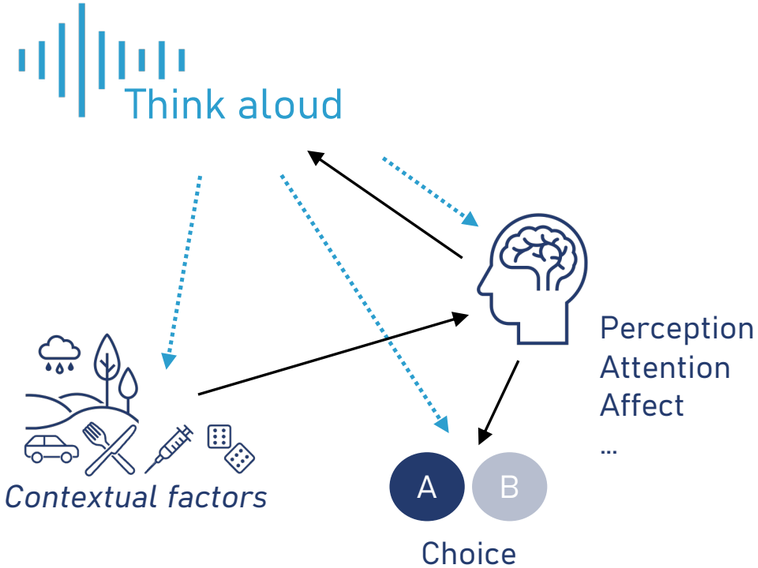


Linguistic markers of uncertainty perceptions
(Ülkümen et al., 2016; Tannenbaum et al., 2017)

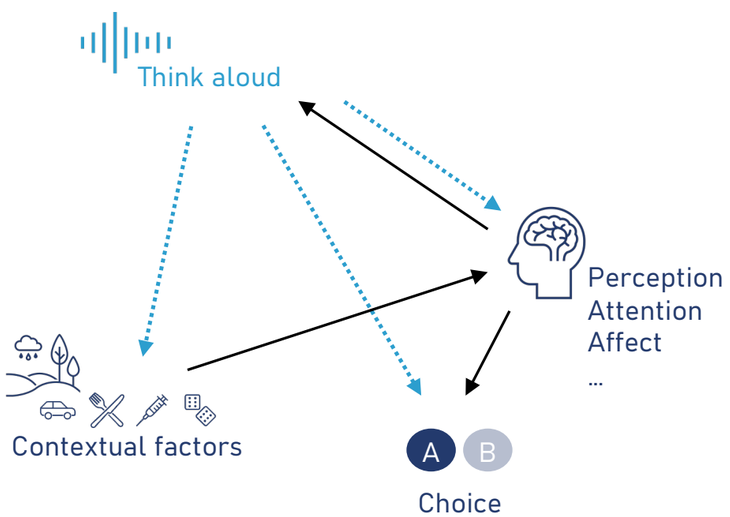
Likelihood statements:
"It is likely that"

Certainty statements:
"I am uncertain that"

Measurement



RQ3: Which **methods** can be used to investigate (everyday) risky choices?



Think aloud:
Certainty statements
Likelihood statements

Perception of uncertainty:
Epistemicness

Procedure

Procedure

Onboarding

- *N*=61
- Risk preference
  (SOEP, Wagner et al., 2007)

Procedure

Onboarding

- *N*=61
- Risk preference

(SOEP, Wagner et al., 2007)

7 days

Ecological momentary assessments (EMA)

Procedure

Onboarding

- *N*=61
- Risk preference
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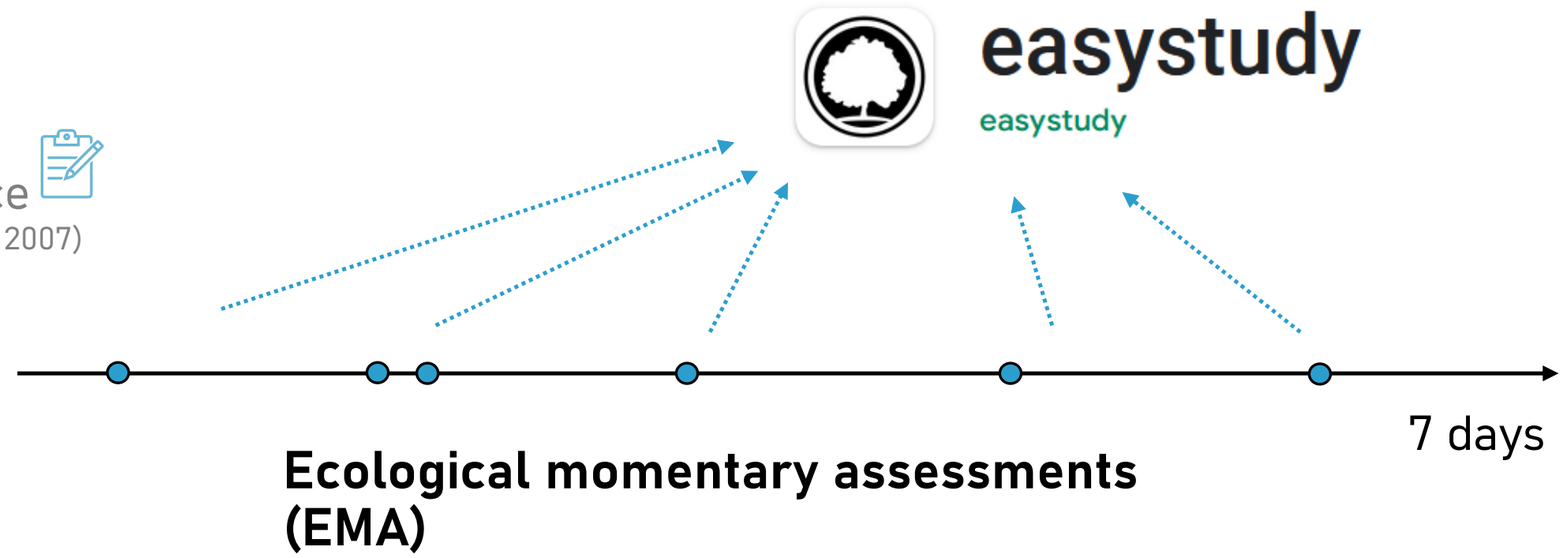

Ecological momentary assessments (EMA)

Procedure

Onboarding

- *N*=61
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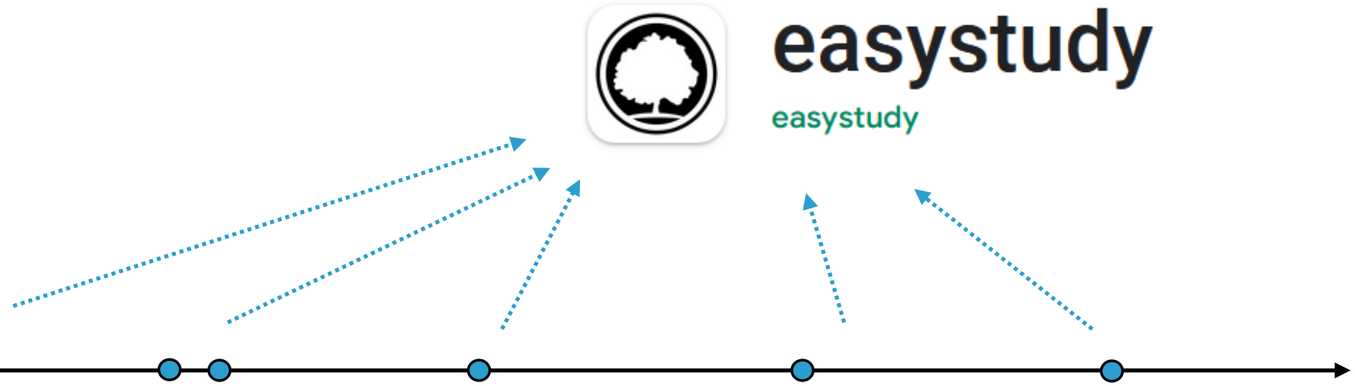


Ecological momentary assessments (EMA)

Transcription using *Whisper*
(Radford et al., 2019)

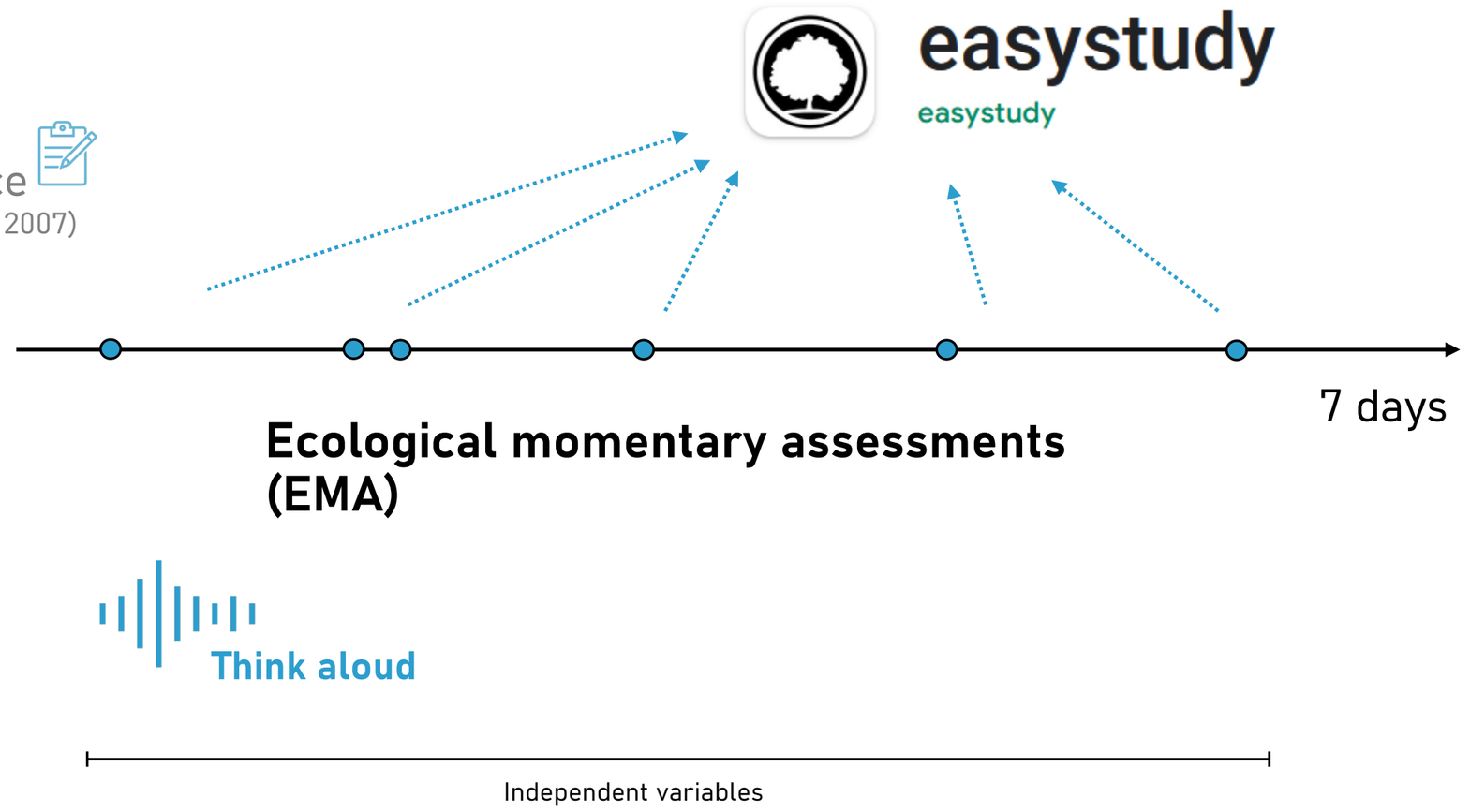
Think aloud

Independent variables

Procedure

Onboarding

- *N*=61
- Risk preference
  (SOEP, Wagner et al., 2007)



Procedure

Onboarding

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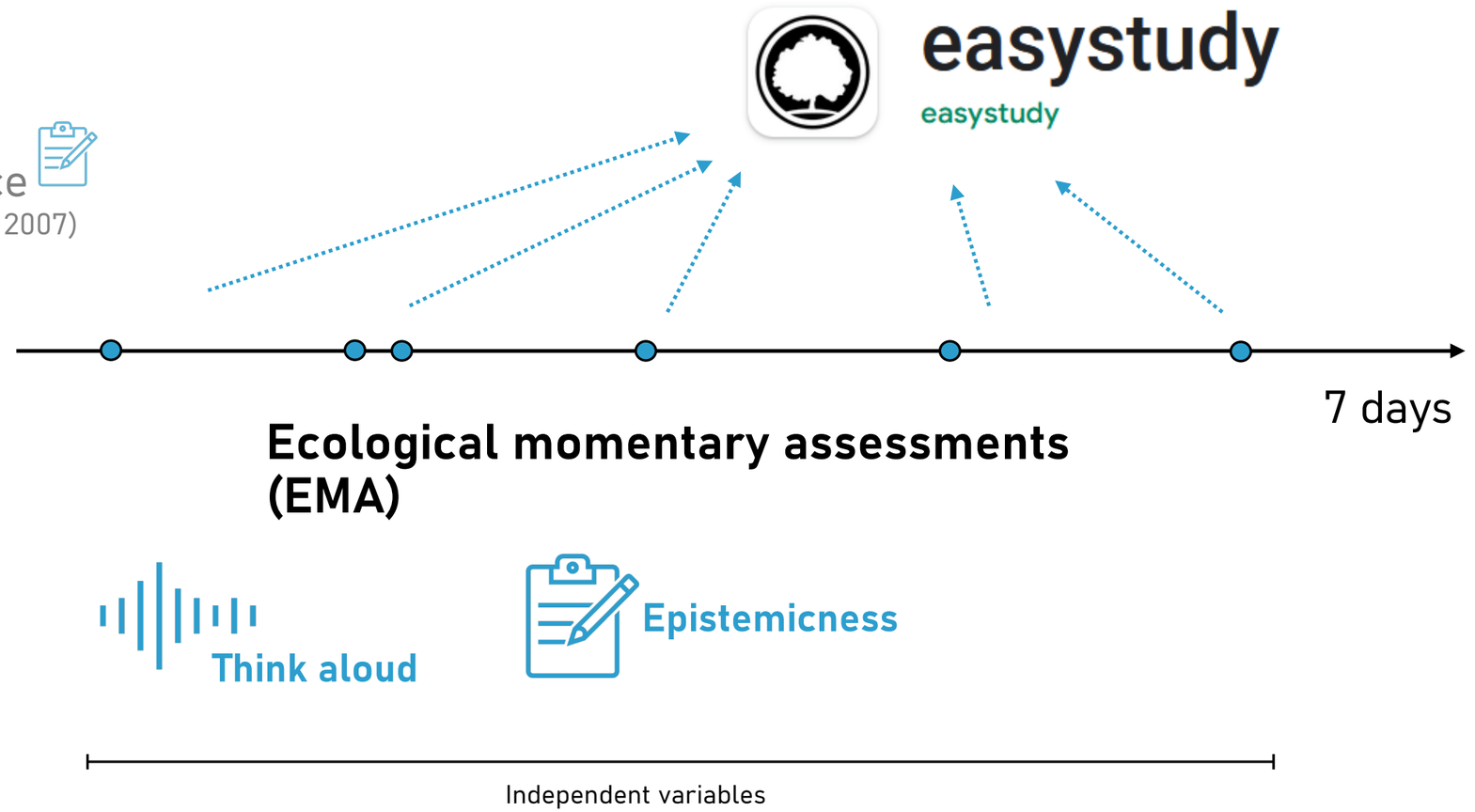

Procedure

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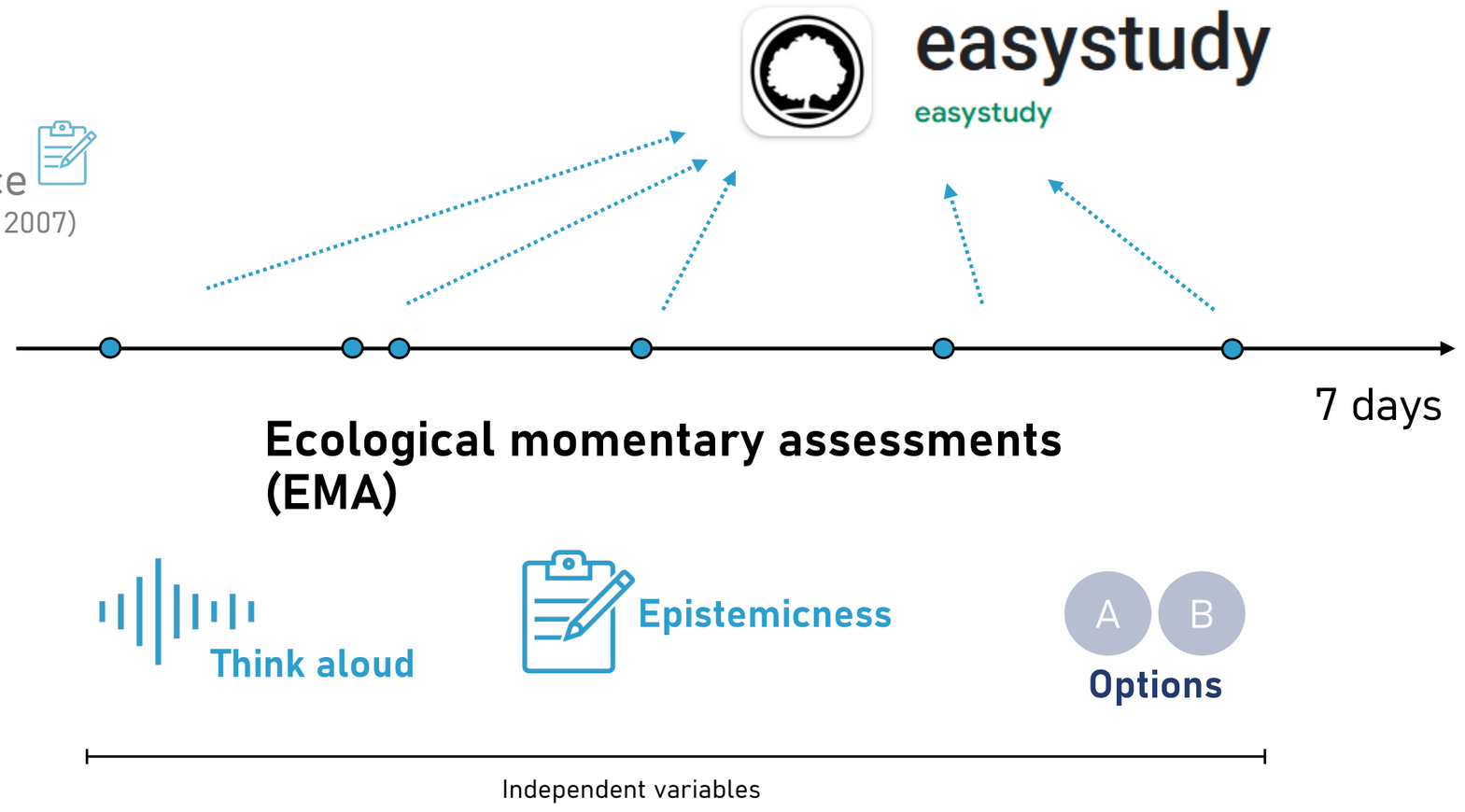


Procedure

Onboarding

- *N*=61
- Risk preference
  (SOEP, Wagner et al., 2007)

easystudy

easystudy

Follow-up

A B

Risky choice

Dependent variable

7 days

Ecological momentary assessments (EMA)

Think aloud

Epistemicness

A B

Options

Independent variables

Modeling risky choices

$$RC_i \sim \text{Bernoulli}(p_i)$$

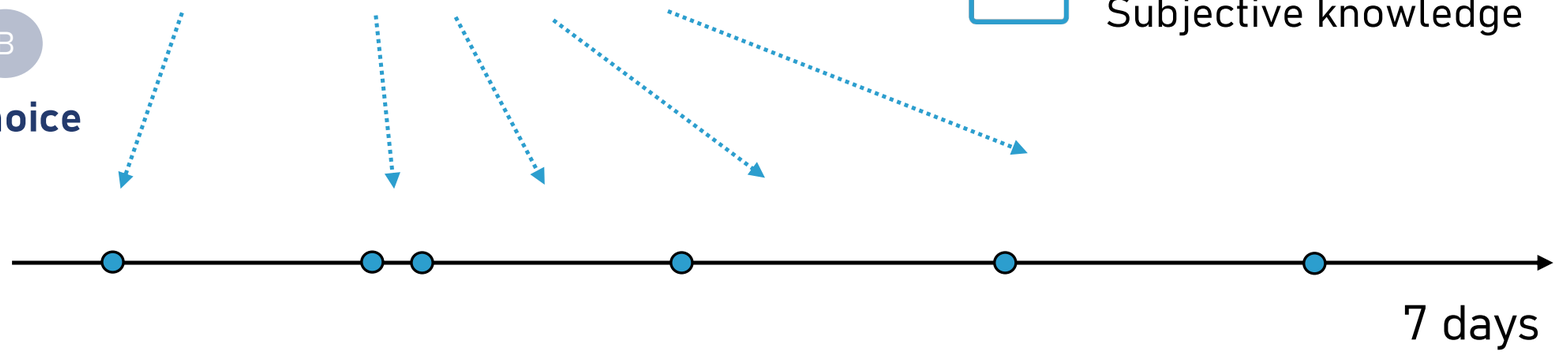
Probability of choosing the risky option

$$\text{logit}(p_i) = (\alpha + u_j) + (\beta_m + v_j)X_{ij} + \epsilon_i$$

Fixed effects

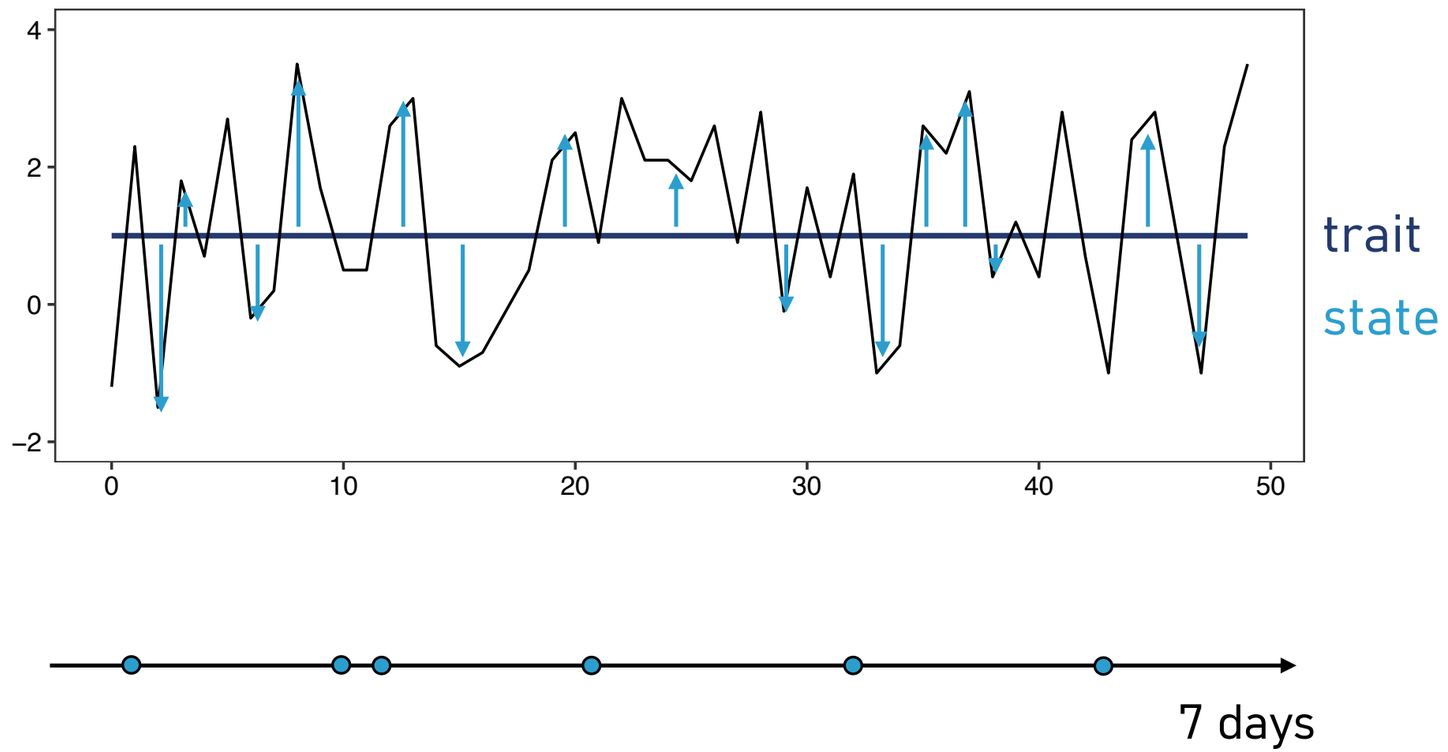
Epistemicness
Risk preference
Subjective knowledge

Risky choice

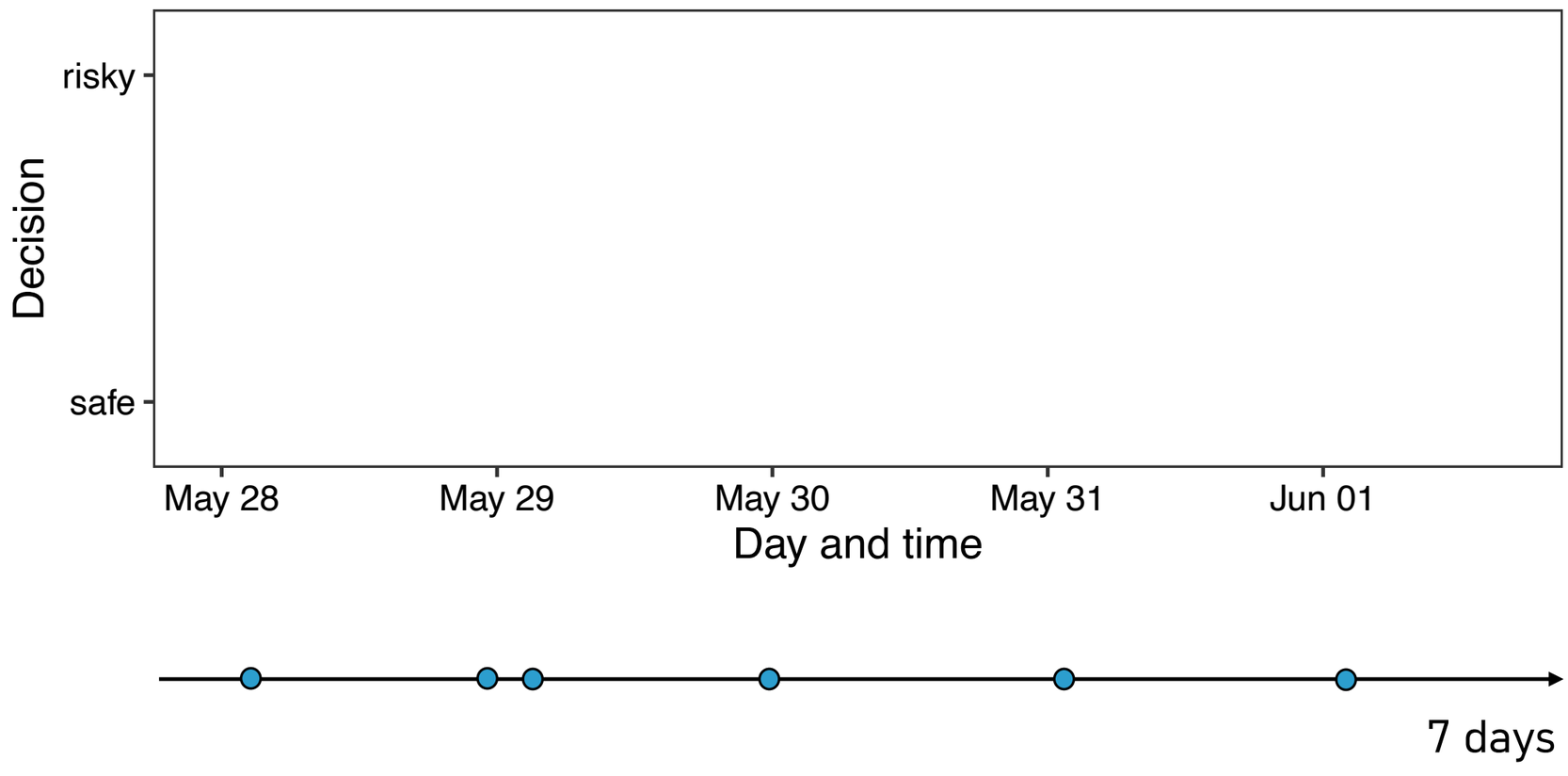


Results

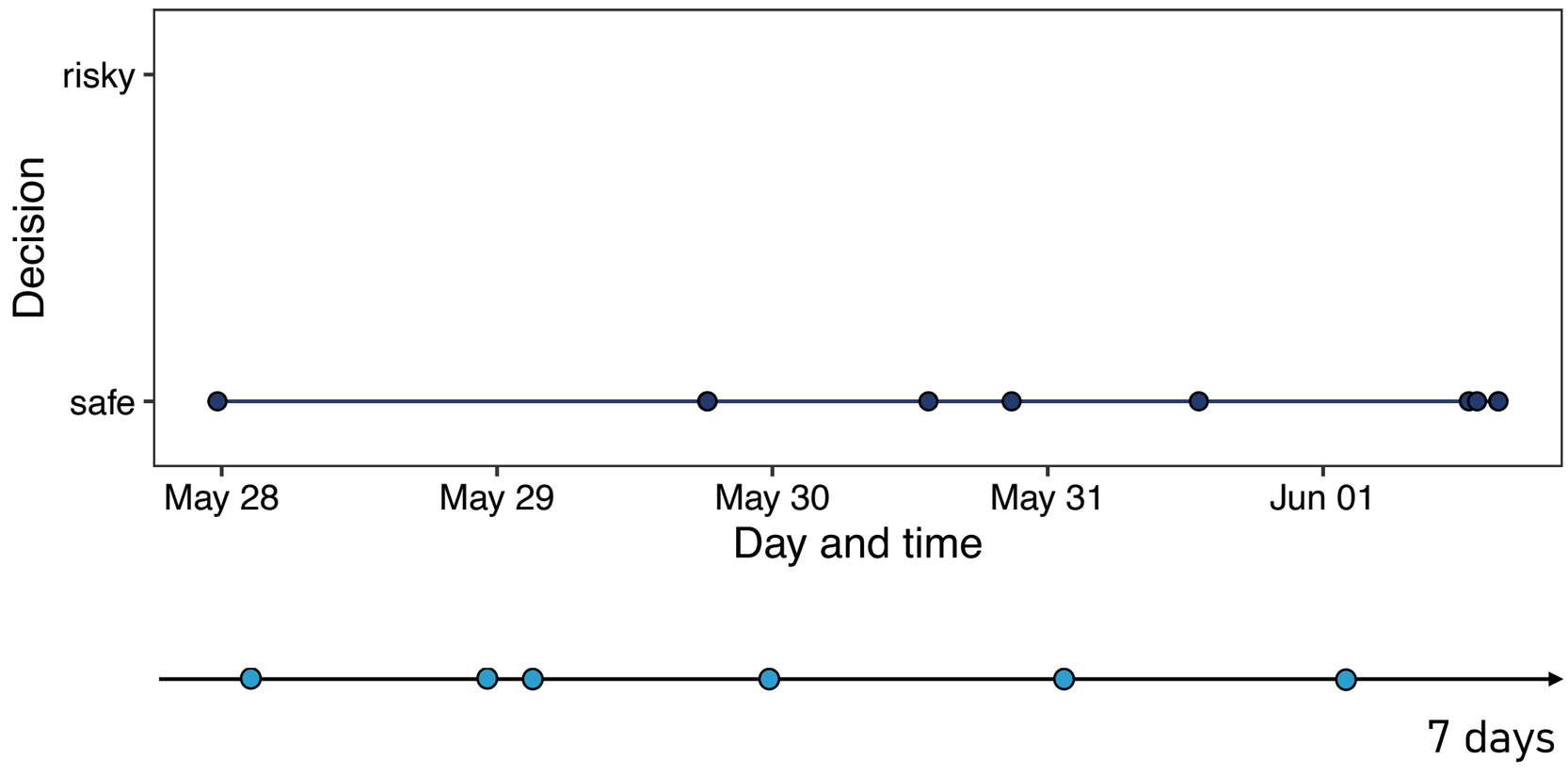
RQ1: To what extent is there **situational variability** in (everyday) risky choices?



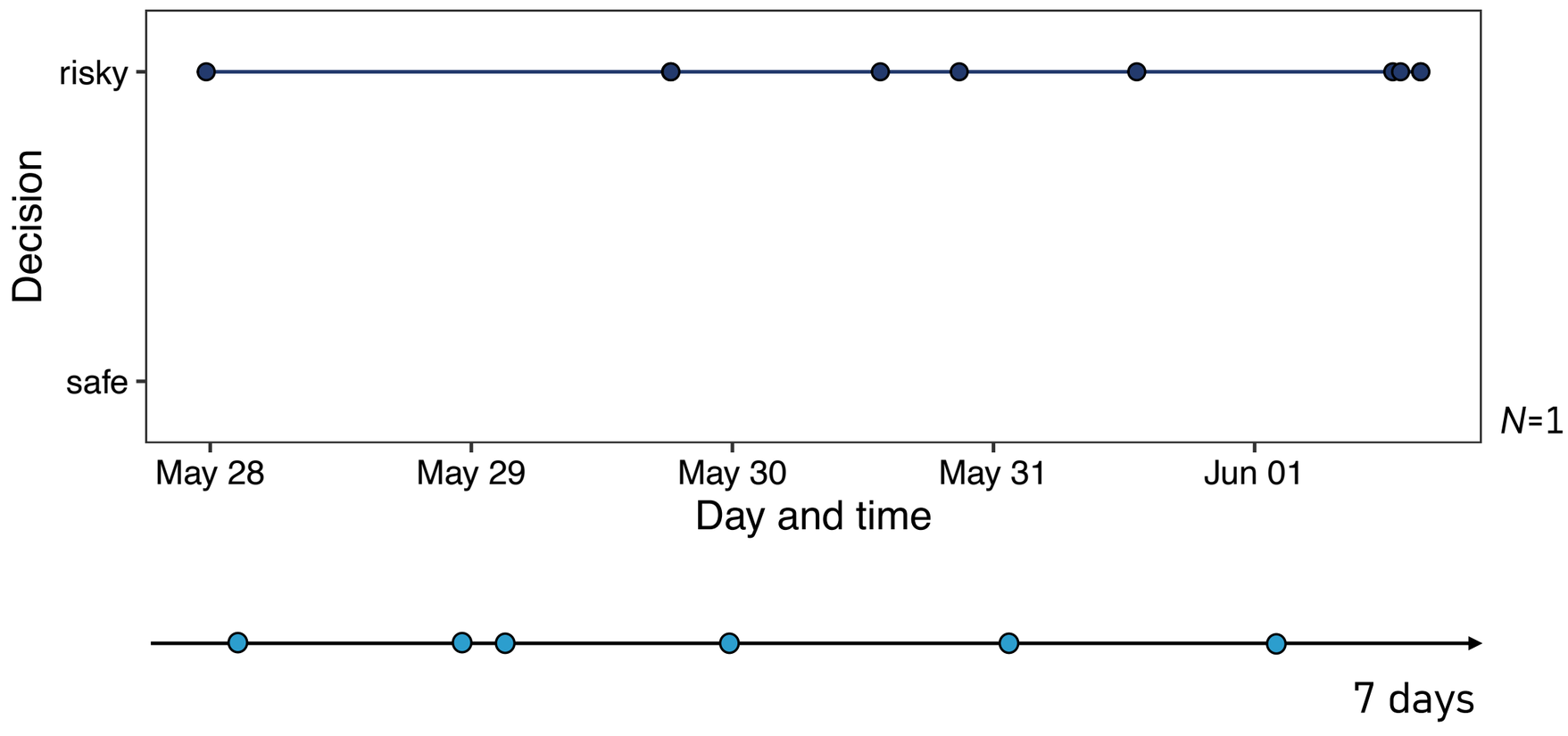
Situational variability



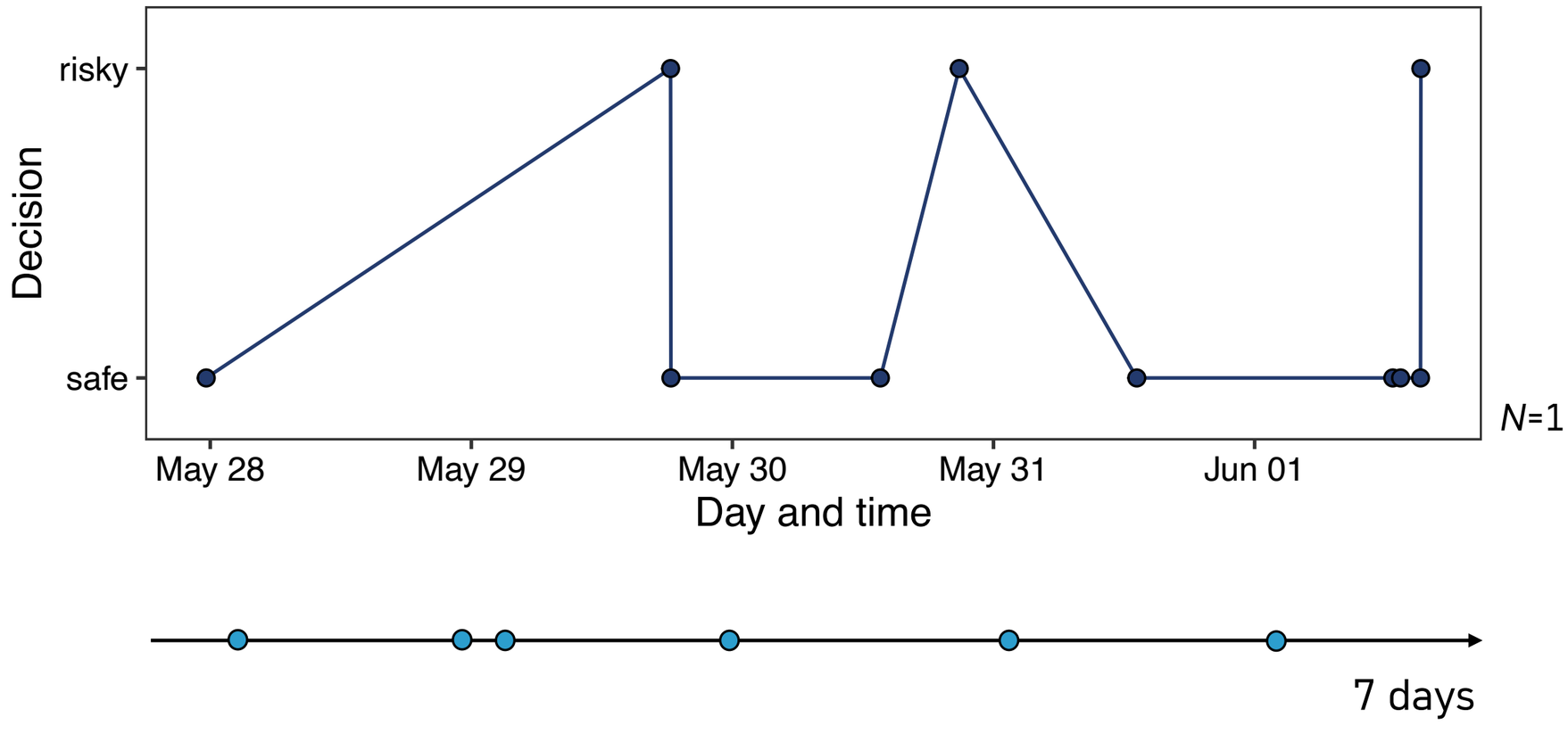
Situational variability



Situational variability



Situational variability



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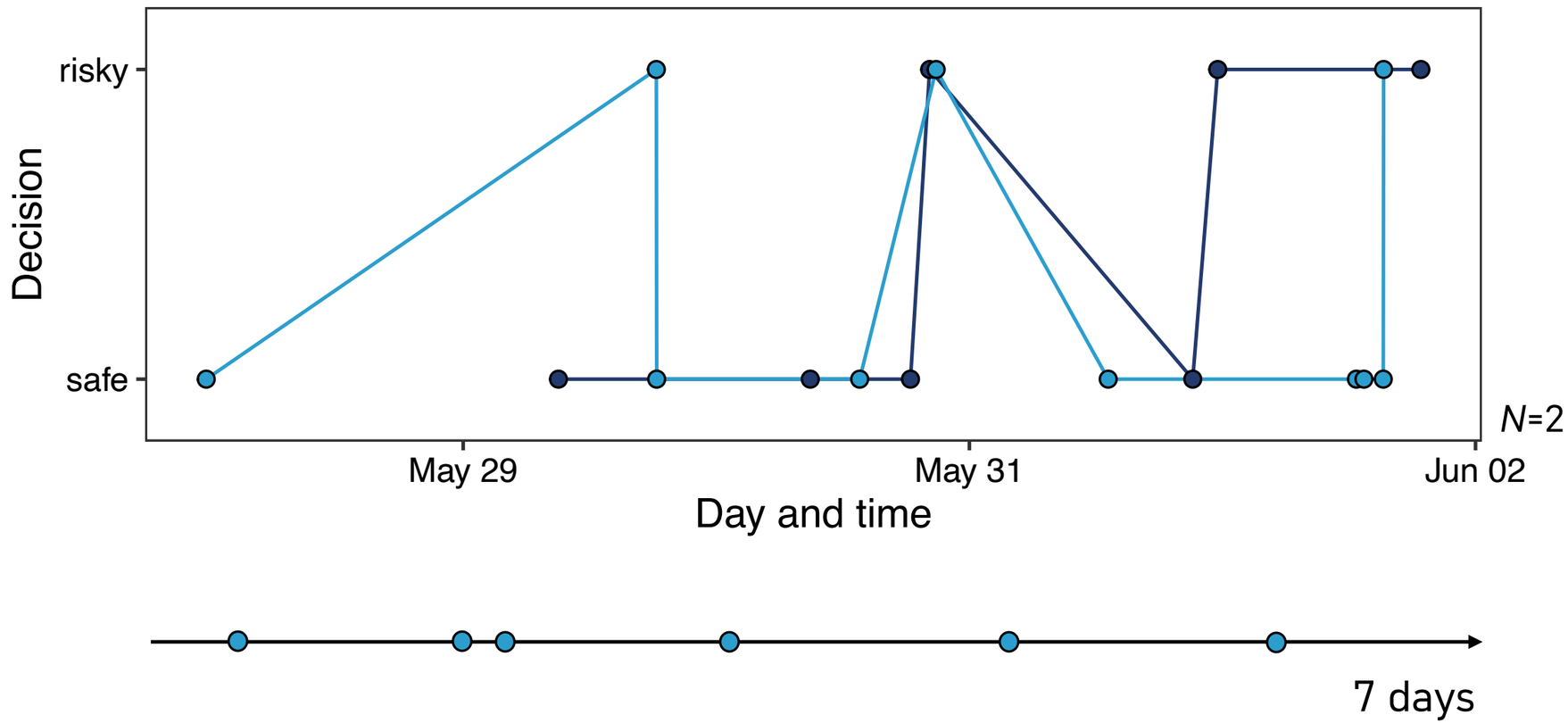
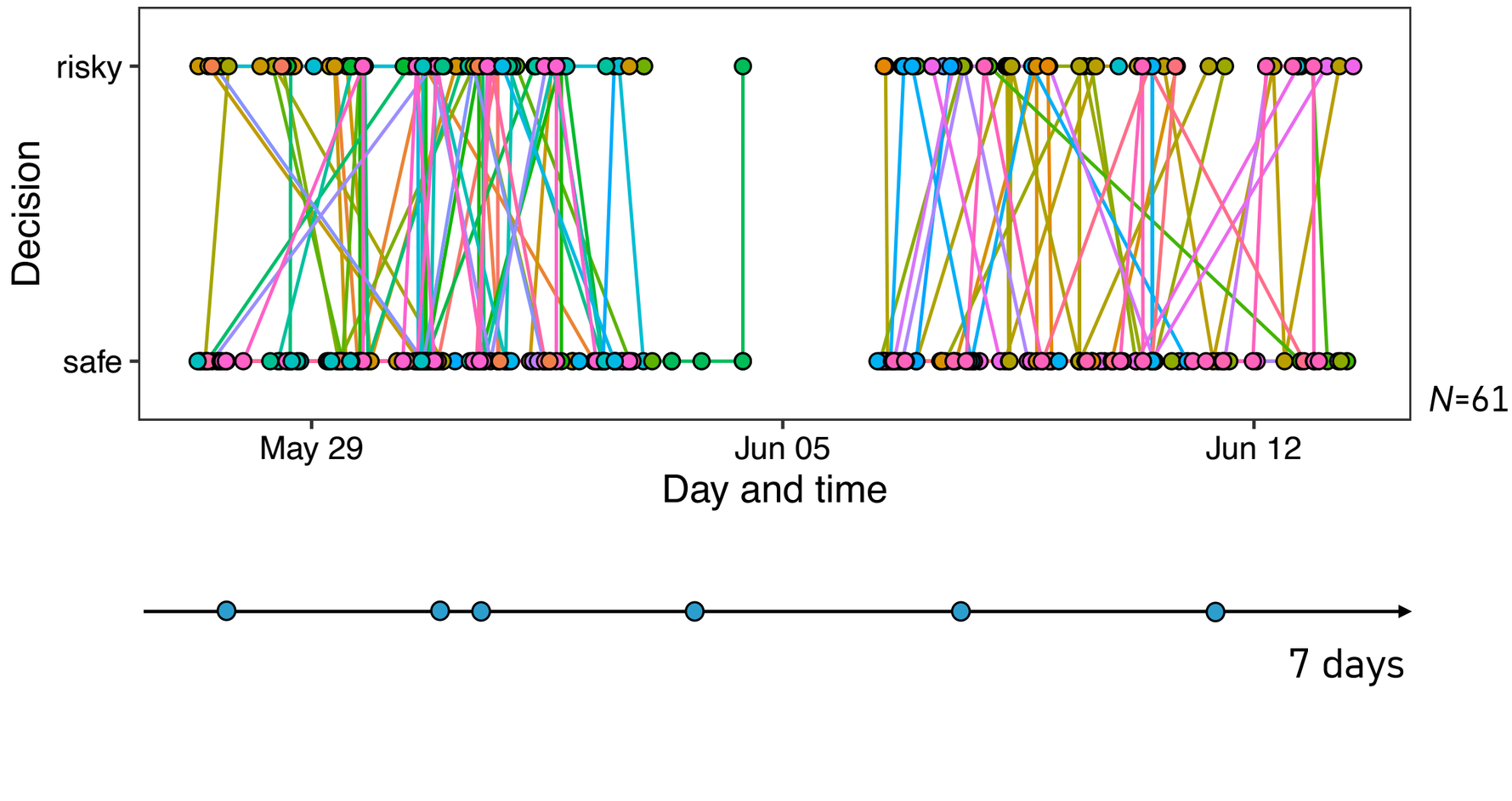
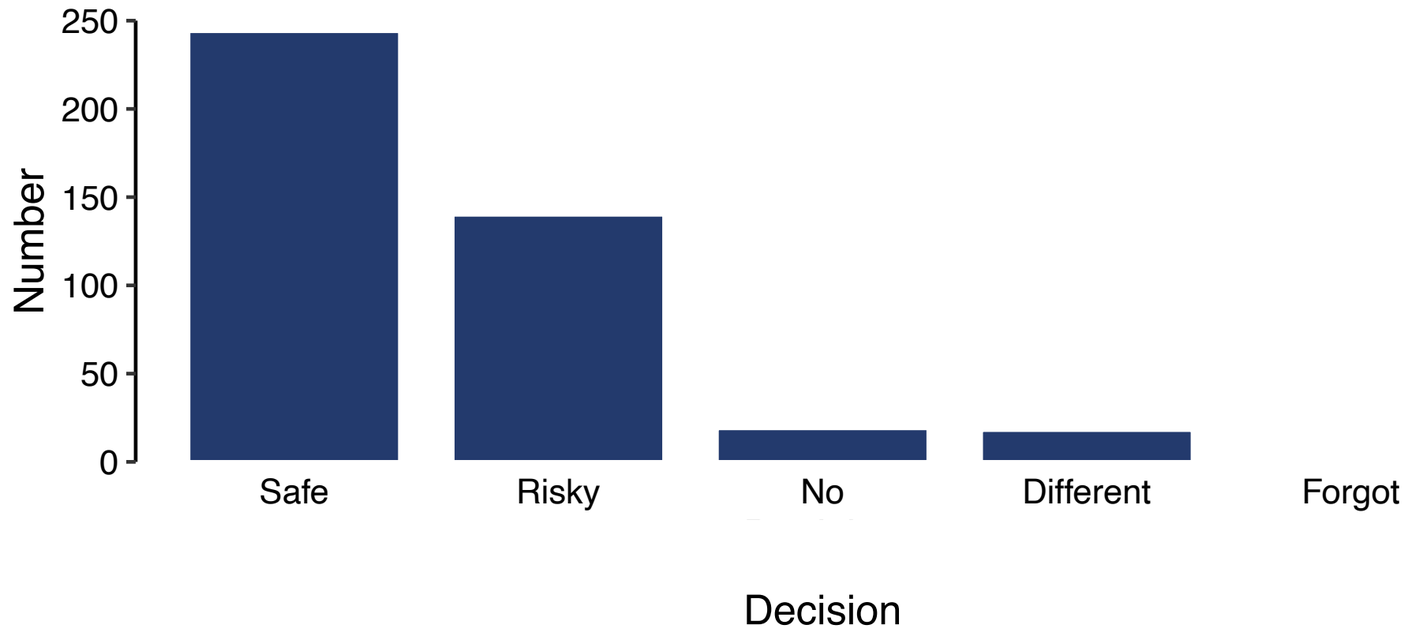


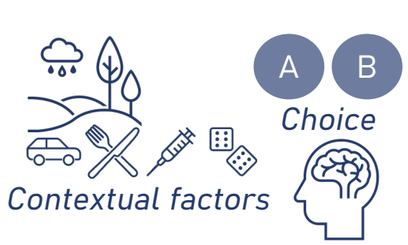
Situational variability



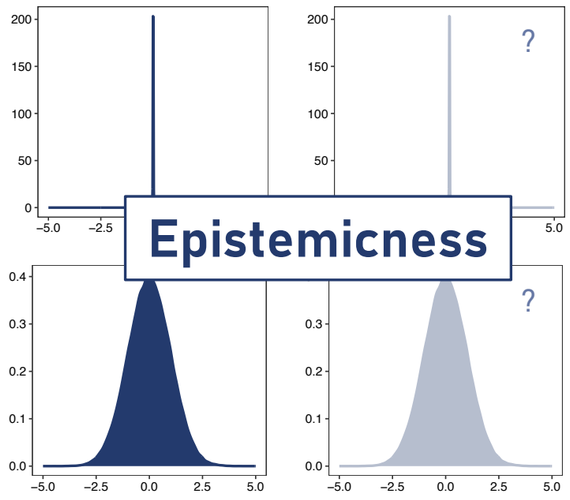
Decisions


250
200
150
100
50
0
Number
Safe
Risky
No
Different
Forgot
Decision

RQ2: Is the **perception of epistemic uncertainty** related to a person's (everyday) risky choices?

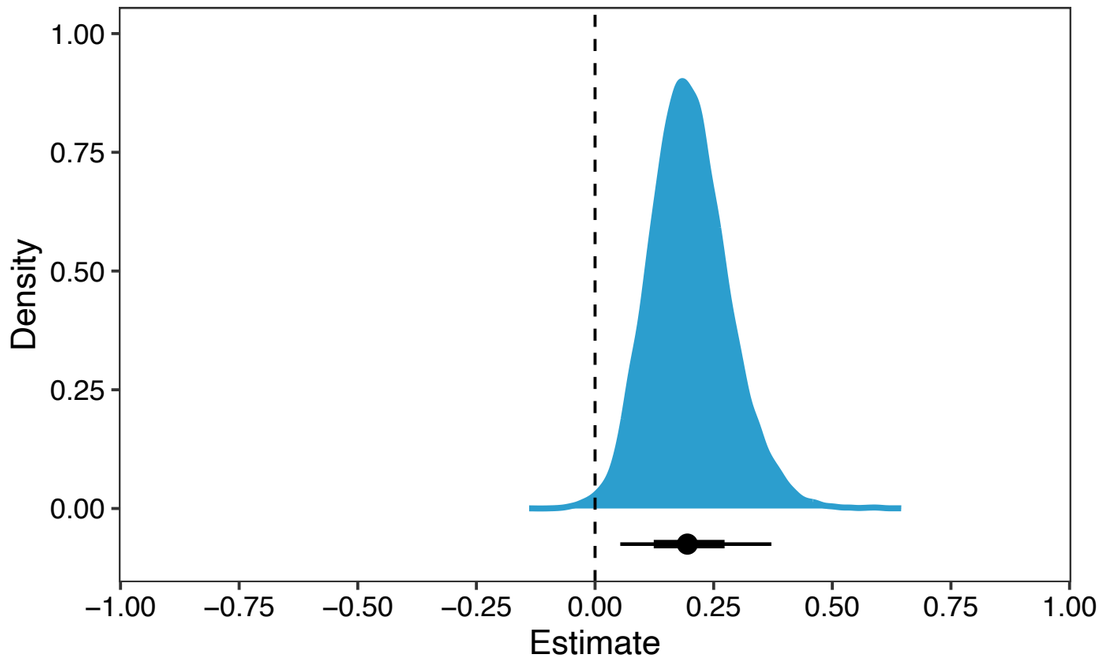


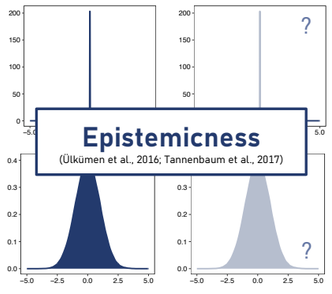
Psychological processes



Modeling situational factors

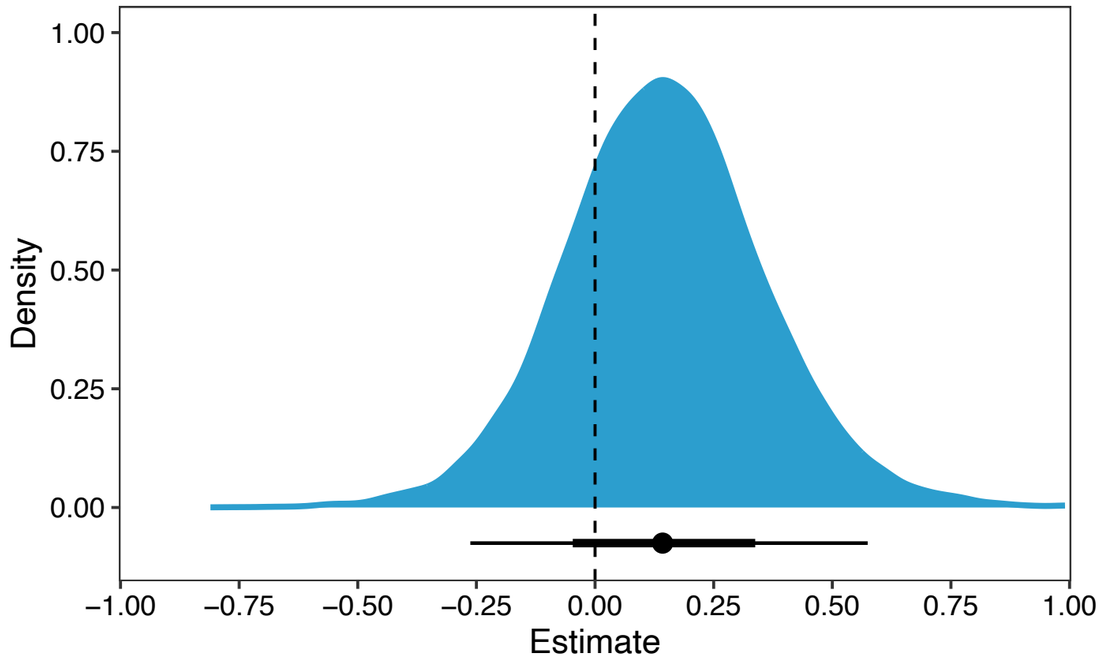
Fixed effects				
Parameter	Estimate [95% HDI]	Odds ratio [95% HDI]	Hypothesis	BF_*
Intercept	−0.69 [−1.10, −0.31]	0.50 [0.33, 0.73]	-	-
Risk preference (RP)	0.20 [0.05, 0.37]	1.22 [1.05, 1.45]	$\beta > 0$	$BF_{10} = 5.05$



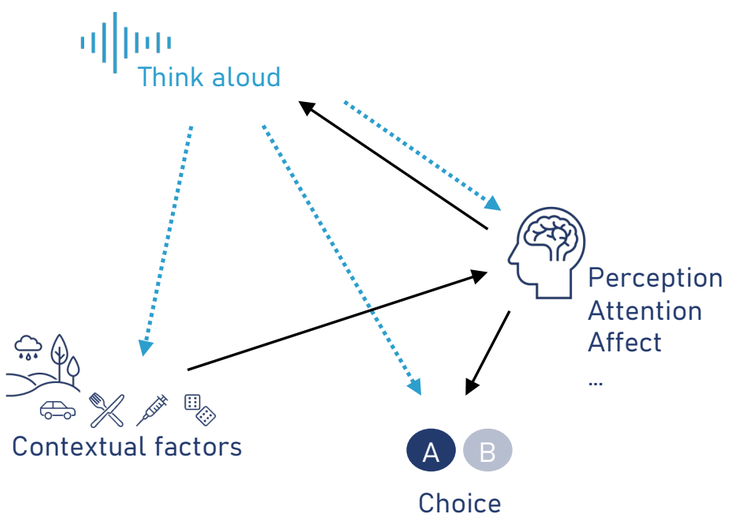


Fixed effects

Parameter	Estimate [95% HDI]	Odds ratio [95% HDI]	Hypothesis	BF_*
Intercept	−0.69 [−1.10, −0.31]	0.50 [0.33, 0.73]	-	-
Risk preference (RP)	0.20 [0.05, 0.37]	1.22 [1.05, 1.45]	$\beta > 0$	$BF_{10} = 5.05$
Epistemicness (E)	0.14 [−0.27, 0.58]	1.15 [0.76, 1.78]	$\beta < 0$	$BF_{01} = 8.13$



RQ3: Which **methods** can be used to investigate (everyday) risky choices?



Think aloud:

Certainty statements

Likelihood statements

Perception of uncertainty:

Epistemicness

Linguistic markers

Think aloud protocols

“certain”, “uncertain”, “certainty”

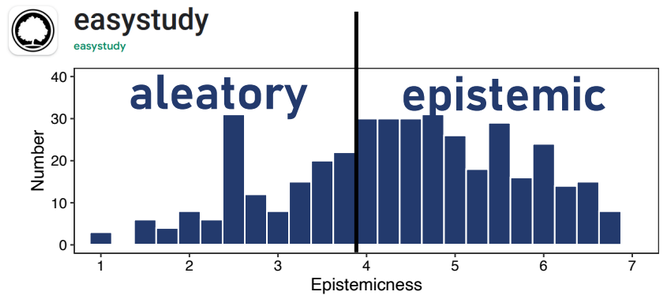
Linguistic markers

Think aloud protocols with “certainty” statement: **21** (out of 422)

Linguistic markers

Think aloud protocols with “certainty” statement: **21** (out of 422)

N situations **mostly epistemic** = **287**



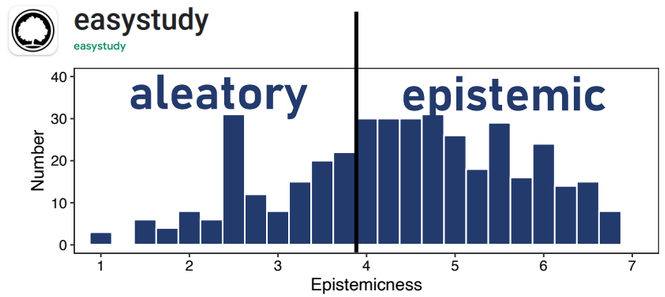
Linguistic markers

7 days

Think aloud protocols with “certainty” statement: **21** (out of 422)

N situations **mostly epistemic** = **287**

N epistemic situations described with “**certainty”** statement = **16**

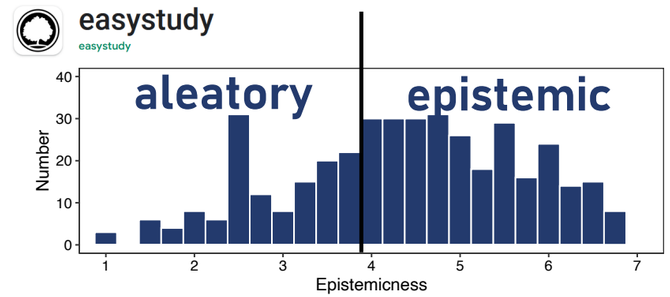


Linguistic markers

7 days

Think aloud protocols with “certainty” statement: **21** (out of 422)

N situations **mostly epistemic** = **287**



N epistemic situations described with “**certainty**” statement = **16**

$$\frac{16}{287} = \mathbf{0.056}$$

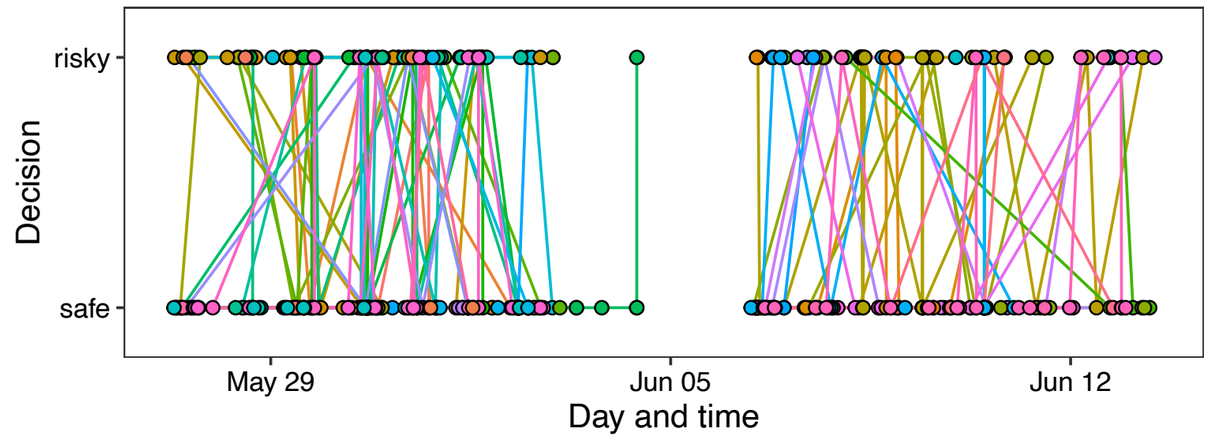
Think aloud:
Certainty statements
Likelihood statements

Perception of uncertainty:
Epistemicness

What did we learn?

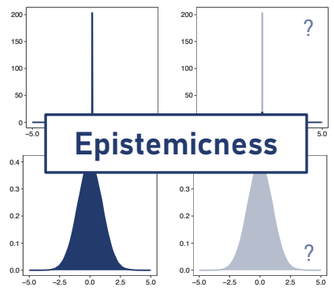
What did we learn?

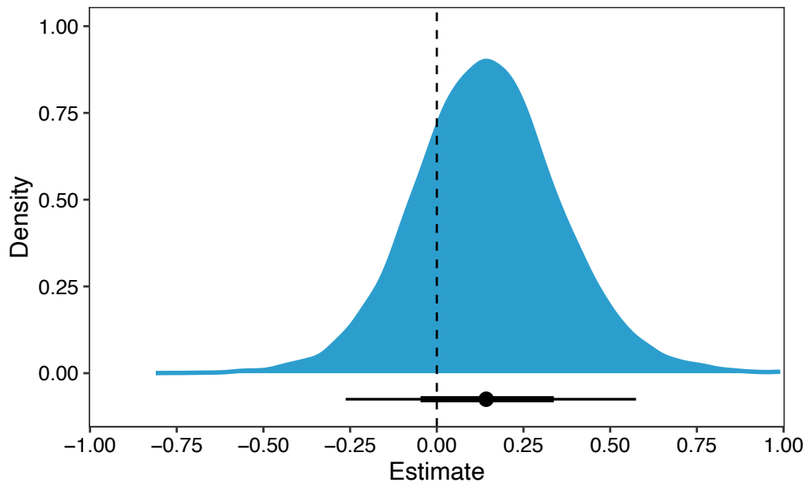
- **Situational variability**



What did we learn?

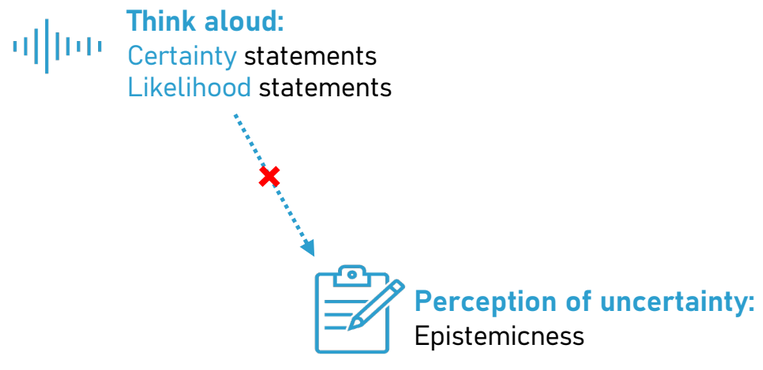
- **Situational variability**
- **Perceived epistemic uncertainty** is unrelated to risky choices





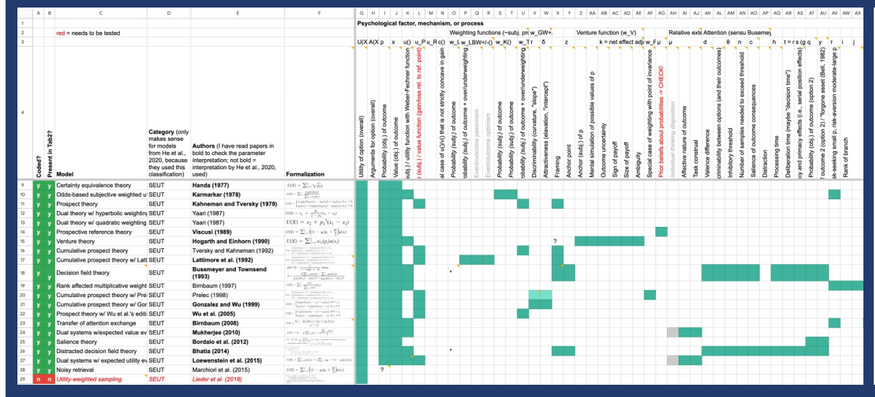
What did we learn?

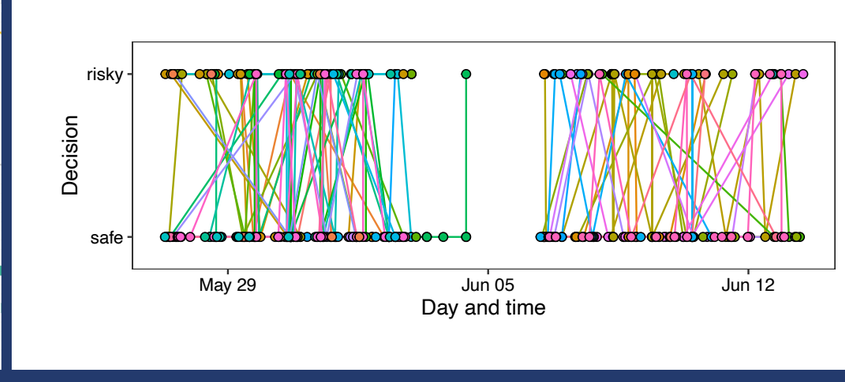
- **Situational variability**
- **Perceived epistemic uncertainty** is unrelated to risky choices
- No evidence for **linguistic markers** of perceived epistemic/aleatory uncertainty



Modeling the influence of perceived situational uncertainty on everyday risky choices

Aaron Lob, Olivia Fischer, & Renato Frey





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https://cbdr-lab.net/lob

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