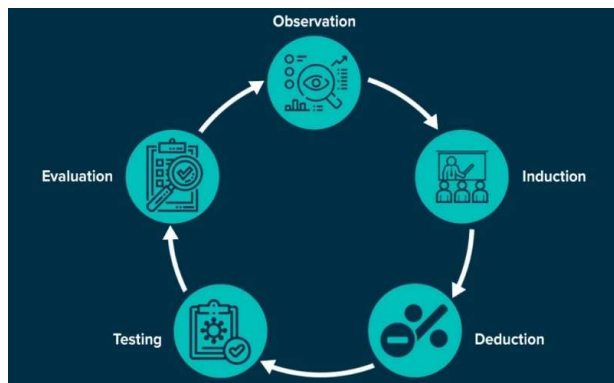


Empirical research in management and economics

Exercise

Thorsten Pachur, Linus Hof, Rebecca West,
Sebastian Hellmann, Nuno Busch

*Technical University of Munich
School of Management
Chair of Behavioral Research Methods*



Exercise 1: Internal consistency

Short version of the Unified Scale to Assess Individual Differences in Intuition and Deliberation (USID)

Deliberative decision style (6 items)

- “Developing a clear plan is very important to me.”
- “I like detailed action plans.”
- “When I make decisions, I proceed step-by-step.”
- “Before making decisions I usually think about the goals I want to achieve.”
- “I prefer making detailed plans rather than leaving things to chance.”
- “I usually have clear, explainable reasons for my decisions.”

Intuitive decision style (15 items)

- “With most decisions it makes sense to completely rely on your feelings.”
- “Using my gut feelings usually works well for me in figuring out problems in my life.”
- “Thinking is not my idea of an enjoyable activity.”
- “I am not a very analytical thinker.”
- “I am often aware of how to cope with a stressful situation even before I review all its aspects.”
- ...

→ Ratings on 5-point scale ranging from 1 = “I don’t agree” to 5 = “I agree completely”.

Pachur & Spaar (2015)

Exercise 1: Internal consistency

- Start JASP and open the file “DecisionStyle.csv” (can be found in the Materials folder)
- Compute Cronbach’s α for the deliberative decision style scale and for the intuitive decision style scale
- Do the scales show satisfactory internal consistency? < 0.8 ☹
- What happens if you submit a mix of items of the two scales to an analysis of internal consistency?

DecisionStyle* (C:\Users\pachur\Documents\Work\TUM Teaching\WS23\Empirical Research Exercises\03_Hypothesis development and research design)

The screenshot displays the JASP software interface. At the top, the file path is shown: "DecisionStyle* (C:\Users\pachur\Documents\Work\TUM Teaching\WS23\Empirical Research Exercises\03_Hypothesis development and research design)". Below the path is a toolbar with icons for Descriptives, T-Tests, ANOVA, Mixed Models, Regression, Frequencies, Factor, Machine Learning, and Meta-analysis. The main area shows a data table with 22 rows and 8 columns. The columns are labeled: Sex, Age, item01_deliberate, item04_deliberate, item07_deliberate, item10_deliberate, item13_deliberate, and item16_deliberate. The data is as follows:

	Sex	Age	item01_deliberate	item04_deliberate	item07_deliberate	item10_deliberate	item13_deliberate	item16_deliberate
1	Female	25	3	2	3	2	4	
2	Female	21	3	2	3	2	3	
3	Female	19	2	1	2	2	1	
4	Female	19	5	4	5	5	4	
5	Female	20	4	4	4	4	3	
6	Female	26	5	1	3	4	2	
7	Female	22	5	4	4	5	5	
8	Female	30	2	4	2	3	2	
9	Female	30	3	3	4	1	2	
10	Female	20	3	4	5	3	4	
11	Female	22	2	4	3	1	4	
12	Female	18	5	4	5	4	4	
13	Female	38	5	4	4	4	5	
14	Male	22	4	4	4	4	3	
15	Male	25	2	2	2	1	2	
16	Female	22	2	4	4	3	2	
17	Female	29	3	3	2	3	3	
18	Male	22	2	2	3	4	3	
19	Female	30	3	5	4	4	3	
20	Female	25	3	3	1	3	2	
21	Female	43	3	5	3	2	2	
22	Female	25	4	3	3	3	2	

The screenshot shows the JASP software interface. The top menu bar includes Descriptives, T-Tests, ANOVA, Mixed Models, Regression, Frequencies, Factor, Machine Learning, Meta-Analysis, and Reliability. The Reliability menu is highlighted with a red circle. Below the menu bar, a table displays data for 22 rows and 9 columns. The columns are labeled: Sex, Age, Item01_deliberate, Item04_deliberate, Item07_deliberate, Item10_deliberate, Item13_deliberate, Item17_deliberate, and Item20. The rows contain data for 22 subjects, with the first column labeled 'Sex' and the subsequent columns labeled with item IDs. The 'Sex' column shows 'Female' for rows 1-13 and 'Male' for rows 14-22. The other columns show numerical values ranging from 1 to 5. On the right side of the interface, a list of statistical tests is displayed, including Audit, Bain, BSTS, Circular Statistics, Cochrane Meta-Analyses, Distributions, Equivalence T-Tests, JAGS, Learn Bayes, Machine Learning, Meta-Analysis, Network, Quality Control, Prophet, and Reliability. The 'Reliability' test is highlighted with a red circle and a blue arrow pointing to it. A hand cursor is visible over the 'Reliability' test.

DecisionStyle* (C:\Users\pachur\Documents\Work\TUM\Teaching\WS23\Empirical Research\Exercises\03_Hypothesis development and research design)

	Sex	Age	Item01_deliberate	Item04_deliberate	Item07_deliberate	Item10_deliberate	Item13_deliberate	Item02_intuitive	Item05_intuitive	Item08_intuitive
1	Female	25	3	2	3	2	4	3	3	5
2	Female	21	3	2	3	2	3	3	4	4
3	Female	47	2	1	2	2	1	2	2	4
4	Female	19	5	4	5	5	4	4	3	2
5	Female	20	4	4	4	4	3	3	3	3
6	Female	26	5	1	3	4	2	4	4	4
7	Female	22	5	4	4	5	5	4	3	5
8	Female	30	2	4	2	3	2	4	3	4
9	Female	30	3	3	4	1	2	5	4	4
10	Female	20	3	4	5	3	4	2	4	3
11	Female	22	2	4	3	1	4	1	3	3
12	Female	18	5	4	5	4	4	4	3	3
13	Female	38	5	4	4	4	5	3	5	4
14	Male	22	4	4	4	4	3	3	4	3
15	Male	25	2	2	2	1	2	1	5	3
16	Female	22	2	4	4	3	2	3	2	3
17	Female	29	3	3	2	3	3	4	5	4
18	Male	22	2	2	3	4	3	3	3	4
19	Female	30	3	5	4	4	3	3	4	4
20	Female	25	3	3	1	3	2	5	4	2
21	Female	43	3	5	3	2	2	1	4	3
22	Female	25	4	3	3	2	2	2	5	3

- Classical
 - Unidimensional Reliability
 - Intraclass Correlation
 - Rater Agreement
 - Krippel's Alpha
- Bayesian
 - Unidimensional Reliability

DecisionStyle* (C:\Users\pachur\Documents\Work\TUM\Teaching\WS23\Empirical Research\Exercises\03_Hypothesis development and sampling)

Unidimensional Reliability

Variables: Item01_deliberate, Item04_deliberate, Item07_deliberate, Item10_deliberate, Item13_deliberate, Item17_deliberate

Analysis: ☒ Coefficient alpha ☒ Coefficient alpha (if item dropped)

Scale Statistics: Confidence Interval 95 %

Individual Item Statistics: Confidence Interval 95 %

Reverse-Scaled Items:

Advanced Options:

Results

Unidimensional Reliability

Frequentist Scale Reliability Statistics

	Coefficient	Estimate	Std. Error	Lower	Upper
Coefficient alpha	0.812	0.030	0.753	0.871	

Frequentist Individual Item Reliability Statistics

Item	Coefficient alpha (if item dropped)			
	Estimate	Lower 95% CI	Upper 95% CI	
Item01_deliberate	0.765	0.694	0.839	
Item04_deliberate	0.812	0.744	0.881	
Item07_deliberate	0.797	0.731	0.863	
Item10_deliberate	0.747	0.660	0.833	
Item13_deliberate	0.766	0.736	0.856	
Item17_deliberate	0.771	0.697	0.845	

DecisionStyle* (C:\Users\pachur\Documents\Work\TUM\Teaching\WS23\Empirical Research\Exercises\03_Hypothesis development and sampling)

Unidimensional Reliability

Variables: Item02_intuitive, Item05_intuitive, Item08_intuitive, Item11_intuitive, Item12_intuitive, Item14_intuitive, Item16_intuitive, Item18_intuitive, Item19_intuitive, Item20_intuitive, Item21_intuitive

Analysis: ☒ Coefficient alpha ☒ Coefficient alpha (if item dropped)

Scale Statistics: Confidence Interval 95 %

Individual Item Statistics: Confidence Interval 95 %

Reverse-Scaled Items:

Advanced Options:

Results

Unidimensional Reliability

Frequentist Scale Reliability Statistics

	Coefficient	Estimate	Std. Error	Lower	Upper
Coefficient alpha	0.855	0.022	0.811	0.899	

Frequentist Individual Item Reliability Statistics

Item	Coefficient alpha (if item dropped)			
	Estimate	Lower 95% CI	Upper 95% CI	
Item02_intuitive	0.850	0.800	0.900	
Item05_intuitive	0.851	0.799	0.902	
Item08_intuitive	0.849	0.804	0.894	
Item11_intuitive	0.849	0.804	0.895	
Item12_intuitive	0.849	0.804	0.895	
Item14_intuitive	0.841	0.792	0.890	
Item16_intuitive	0.846	0.799	0.893	
Item18_intuitive	0.843	0.796	0.891	
Item19_intuitive	0.842	0.793	0.890	
Item20_intuitive	0.843	0.794	0.891	
Item21_intuitive	0.842	0.793	0.890	
Item02_intuitive	0.855	0.812	0.898	
Item05_intuitive	0.846	0.803	0.889	
Item08_intuitive	0.843	0.798	0.889	
Item11_intuitive	0.839	0.793	0.885	

DecisionStyle* (C:\Users\pachur\Documents\Work\TUM\Teaching\WS25\Empirical Research\Exercises\03_Hypothesis development and sampling)

[Edit Data](#)
[Descriptives](#)
[T-Tests](#)
[ANOVA](#)
[Mixed Models](#)
[Regression](#)
[Frequencies](#)
[Factor](#)
[Machine Learning](#)
[Meta-Analysis](#)
[Power](#)
[Process](#)
[Reliability](#)

Unidimensional Reliability

Variables

- Sex
- Age
- Item03_intuitive
- Item05_intuitive
- Item06_intuitive
- Item08_intuitive
- Item09_intuitive
- Item11_intuitive
- Item12_intuitive
- Item14_intuitive
- Item15_intuitive
- Item16_intuitive
- Item18_intuitive
- Item19_intuitive
- Item20_intuitive
- Item21_intuitive

Variables

- item01_deliberate
- item04_deliberate
- Item07_deliberate
- Item10_deliberate
- Item13_deliberate
- Item17_deliberate
- Item02_intuitive

Analysis

Scale Statistics

Confidence interval 95 %

☐ Coefficient ω
☒ Coefficient α
☐ Guttman's λ^2
☐ Split-half coefficient
☐ Average interitem correlation
☐ Mean ☐ Variance ☐ SD
 of participants' sum scores
 of participants' mean scores

Individual Item Statistics

Confidence interval 95 %

☐ Coefficient ω (if item dropped)
☒ Coefficient α (if item dropped)
☐ Guttman's λ^2 (if item dropped)
☐ Split-half coefficient (if item dropped)
☐ Item-rest correlation
☐ Mean ☐ Variance ☐ SD

Reverse-Scaled Items

Advanced Options

Results

Unidimensional Reliability

Frequentist Scale Reliability Statistics

Coefficient	Estimate	Std. Error	95% CI	
			Lower	Upper
Coefficient α	0.709	0.044	0.623	0.795

Note. The following item correlated negatively with the scale:
Item02_intuitive.

Frequentist Individual Item Reliability Statistics

Item	Coefficient α (if item dropped)		
	Estimate	Lower 95% CI	Upper 95% CI
item01_deliberate	0.621	0.512	0.730
item04_deliberate	0.683	0.576	0.789
Item07_deliberate	0.656	0.555	0.756
Item10_deliberate	0.607	0.487	0.727
Item13_deliberate	0.660	0.559	0.761
Item17_deliberate	0.633	0.507	0.740
Item02_intuitive	0.812	0.753	0.871

Exercise II: Concepts in research design

1) When a researcher develops an experiment, they will decide what they want to manipulate as part of the experimental procedure. The variable controlled by the experimenter is the _____ variable.

- a. Hypothetical.
- b. Extraneous.
- c. Independent.
- d. Construct.

2) If a measurement of depression on a standardized depression inventory is useful in understanding an individual's depression, that measurement is said to:

- a. Show good reliability.
- b. Eliminate nonsampling error.
- c. Be representative.
- d. Have validity.

Exercise II: Concepts in research design

3) Construct validity refers to how well:

- a. Your measured variable relates to the underlying concepts you are trying to measure.
- b. Your measurements agree with the measurements of others.
- c. Your statistical tests help you answer your research questions.
- d. Your measurements correlate with one another.

4) If you want to generalize the results of your research to a different population, your measurements should show:

- a. Convergent validity.
- b. Construct validity.
- c. External validity.
- d. Internal validity.

Exercise III: Research design

In groups of 3-5

A company aims to improve its work conditions and has the following hypothesis: “Improved training provision will create a more productive, reliable, and satisfied workforce.”

- Is the hypothesis falsifiable? How would it be (non)falsifiable? What is your assessment of the empirical content of the hypothesis (i.e., universality and precision)?
- Design a study that allows you to test the hypothesis
 - What are the dependent and independent variables in your design?
 - How do you operationalize the variables?
 - How could you ensure that the variables allow for a reliable and valid measurement?
 - What could be possible moderators and mediators for the relationship between the independent and the dependent variable?

