



22ND EUROPEAN CONGRESS OF WORK
AND ORGANIZATIONAL PSYCHOLOGY



Open Science Bazaar: What can we do to increase trust in Work and Organizational Psychology?

From Open Materials to Multiverses of Datasets

A Tutorial on Intensive Longitudinal Data Pre-processing

Luca Menghini¹, Enrico Perinelli², Cristian Balducci³, Psicostat Core Team¹

¹University of Padova, ²University of Trento, ³University 'G. d'Annunzio' of Chieti-Pescara



European Association of Work
and Organizational Psychology



Open materials
ooooo

ILD pre-processing
ooo

Multiverse
ooo

Discussion
oooo

Open materials

= Sharing of **stimuli/questionnaires**, data pre-processing & data analysis **syntax/scripts** and **full outputs**

BMJ 2019;367:l6365 doi: 10.1136/bmj.l6365 (Published 21 November 2019)

Page 1 of 2

EDITORIALS

Why researchers should share their analytic code

Retraction of a trial shows the importance of transparency

Ben Goldacre *director*, Caroline E Morton *researcher*, Nicholas J DeVito *researcher*

DataLab, Nuffield Department of Primary Care Health Sciences, University of Oxford, Oxford, UK

Sharing the complete set of materials that generated the results

Complementary to sharing the data



Why sharing materials?

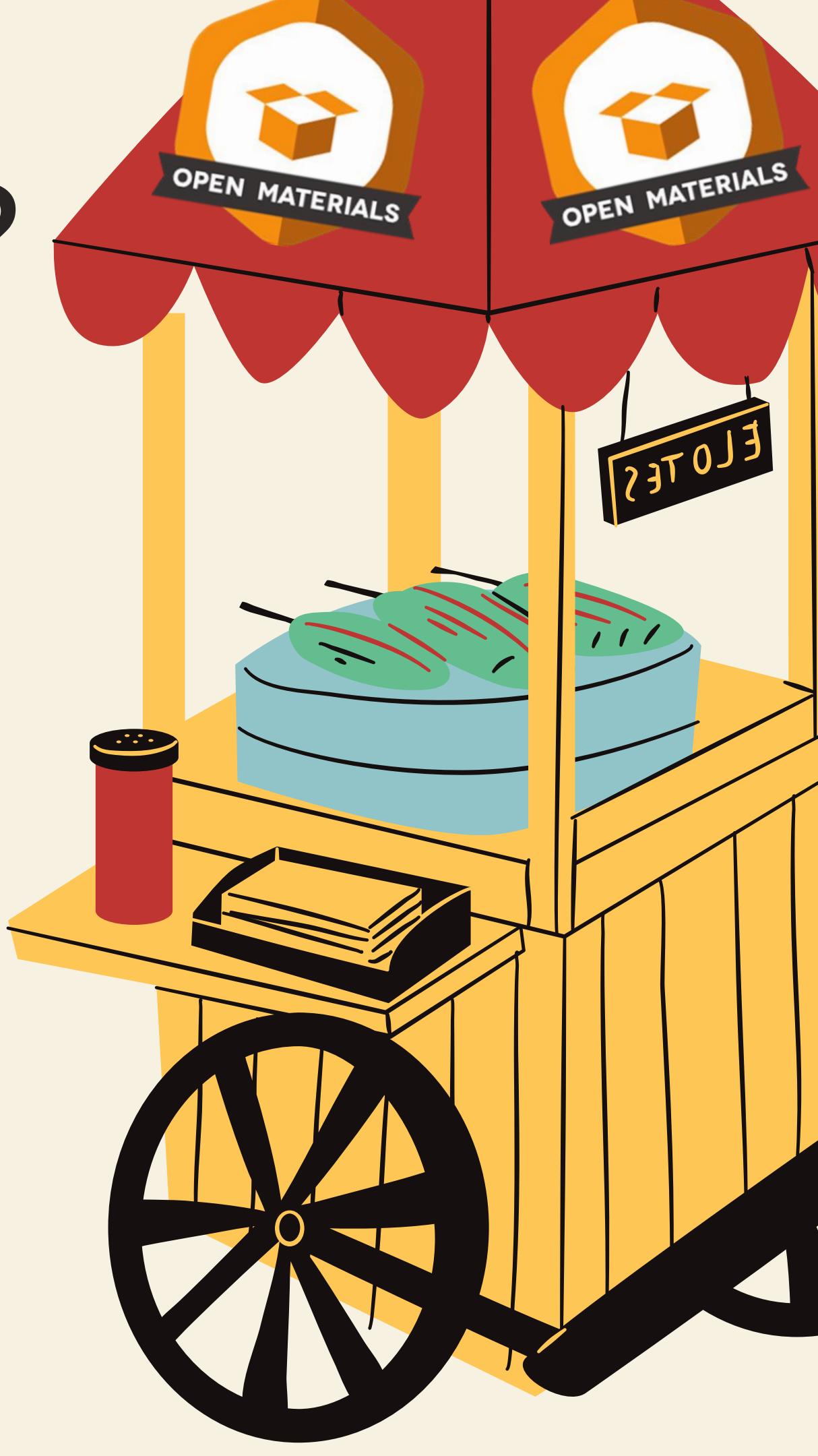
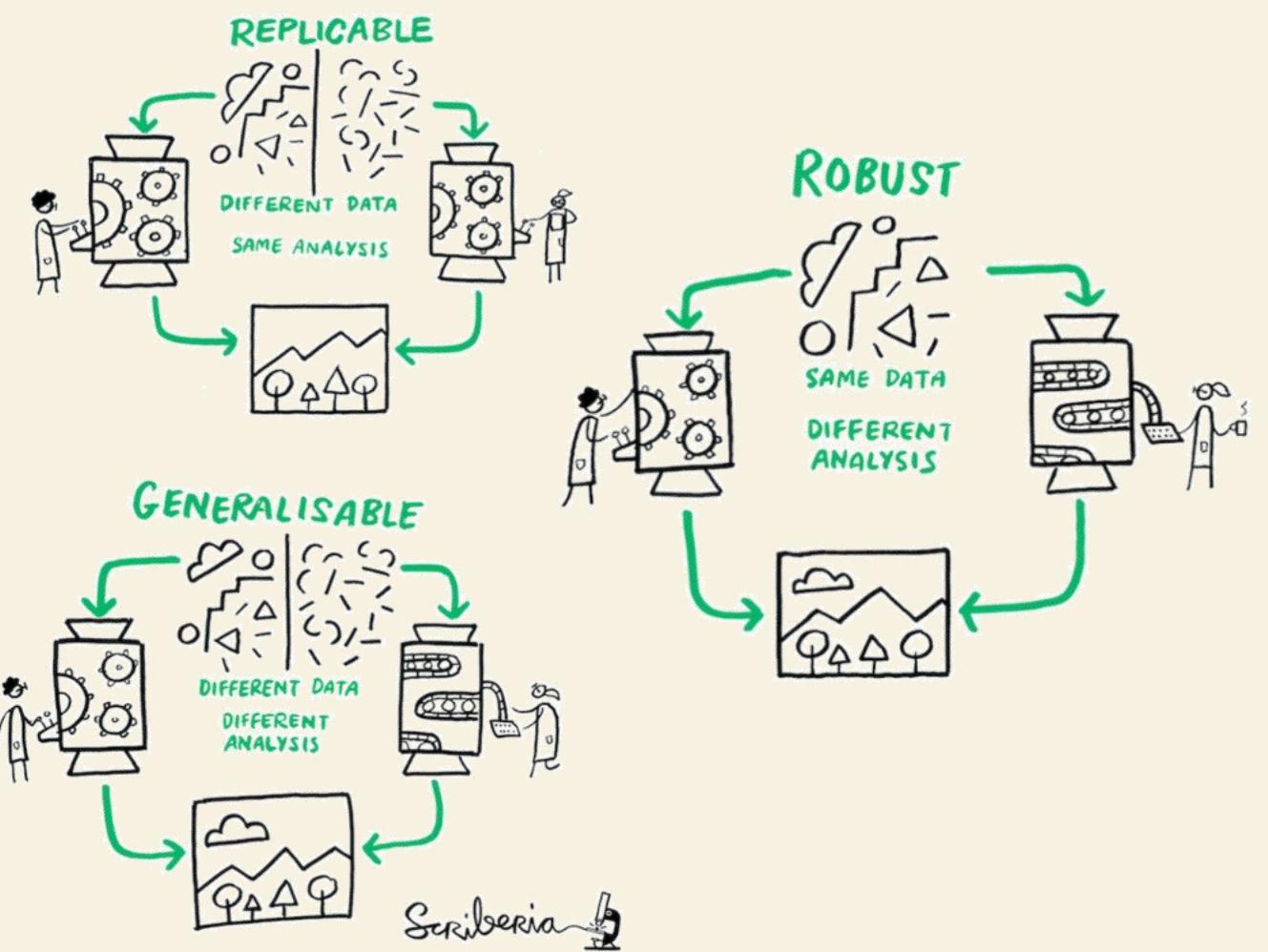
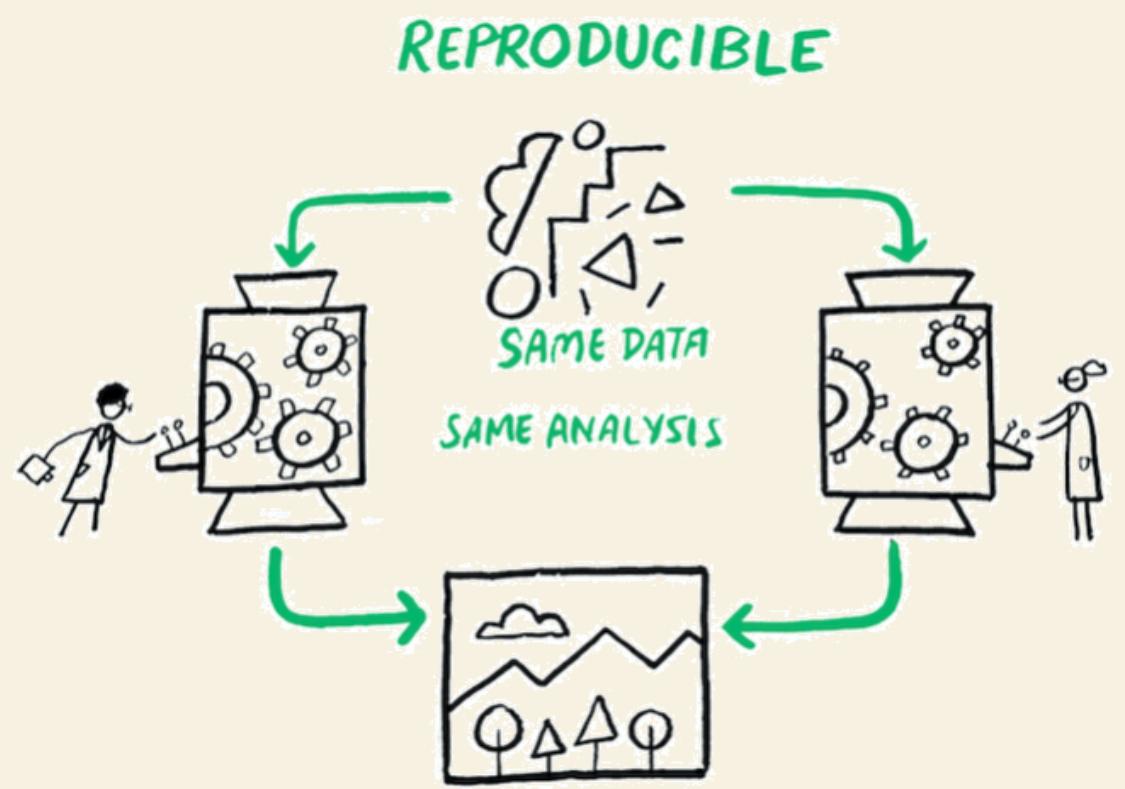
To improve the **reproducibility** of a study

= ability to produce the same results of a previous study

by using the same data and materials

(independent cross-checking)

= minimum required condition for a study to be **credible**



Open materials
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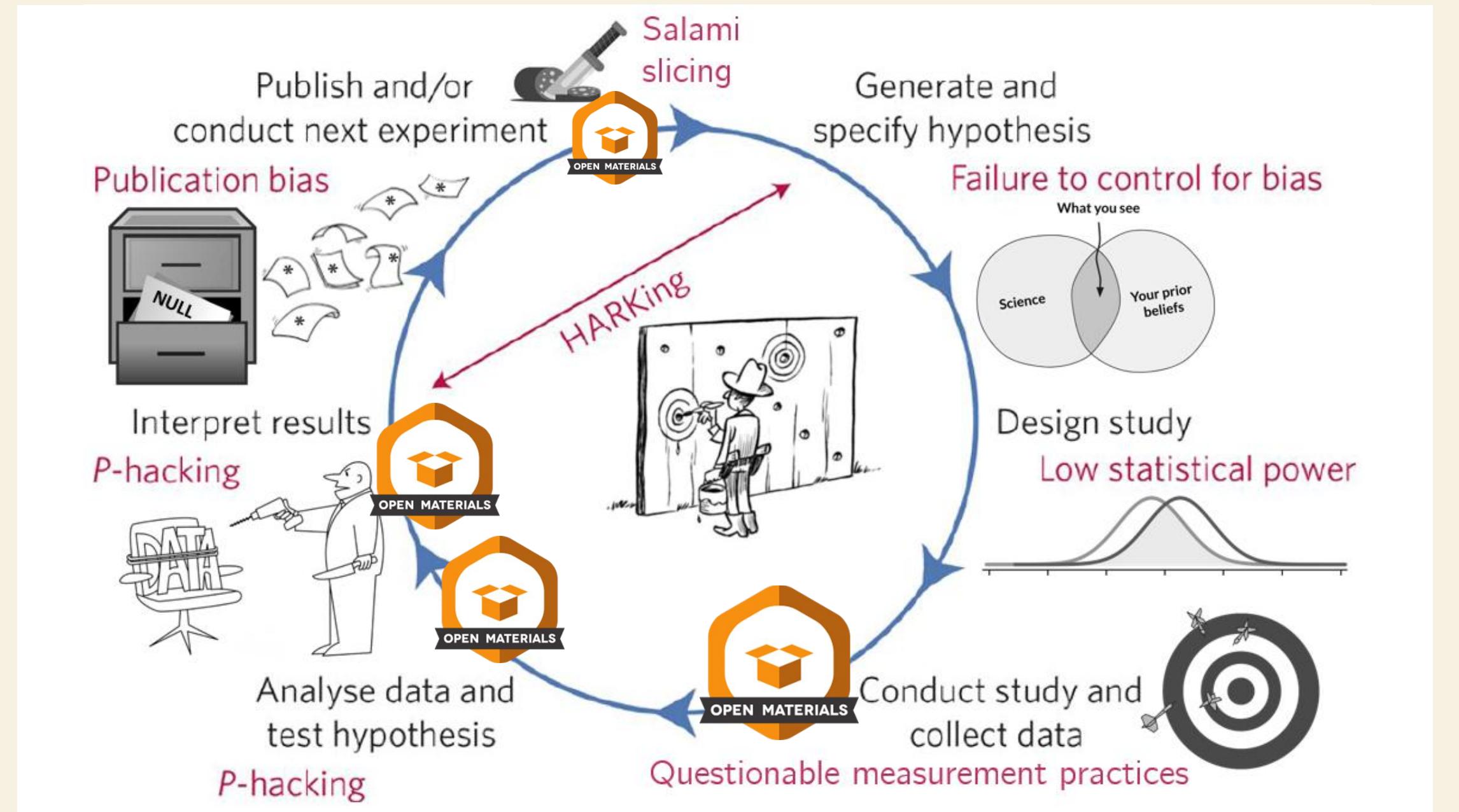
ILD pre-processing
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Multiverse
ooo

Discussion
oooo

Why sharing materials?

To prevent **Questionable Research Practices**



How not to share the materials?

Contents:

- Latent profile, pri
- Mplus syntax for j
- SPSS logistic regre
- HLM-7 regression
- Mplus results

Latent profile analyses

No. categories	L H ₀ Value	AIC	BIC	c1	c2	c3	c4	c5	Entropy	BLRT	VLMR
1	-2284.24	4618.48	4695.83	163							
2	-2009.32										
3*	-1899.06										
4*	-1857.00										
5*	-1824.65										

L H₀: Loglikelihood ratio; VLMR: Vuong-Lo-Mendell-Rubin test.
* Note solution had eigenvalues less than zero.

Principal component analysis

Management support
Governance

DEFINE:
prafacsq = prafac * prafac; !! Calculates
CENTER phy15 kes15 choice15 bully15
!! These are level 1 control variables

ANALYSIS:
TYPE = TWOLEVEL RANDOM;
ESTIMATOR = BAYES;
THIN = 20;
CHAINS = 3;
BCONVERGENCE = .01;
BITERATIONS = (1000);

MODEL:
%WITHIN%
phycat16 ON phy15 choice15 bully15 du
phycat16 ON kes15;

kes15 WITH phycat16 choice15 bully15 pr

1 / 3269

100%

Fixed Effects

physical_health

kess_t15

choice_freq

bullying_freq

timecwc2

timem2

fac2time

duties_freq

FAC1_1

kescat16

Universitas Studiorum Athenaeum MCCCII

Ud'A

SUMSTAT

Open materials
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ILD pre-processing
ooo

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ooo

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oooo

How to share the materials?

(and the data)



Findable

Making them easy to find by both humans and computers

Rich metadata & Machine-readable unique identifiers (e.g., DOI)



Accesible

Making them easy to retrieve and download

“Available upon request” vs

Open, free, & universal communication protocols



Interoperable

Making them easy to be integrated with other data/materials and to be operated with different workflows, storages, & processing pipelines

Use of formal, accessible, and shared language, with FAIR-based vocabularies



SCIENTIFIC DATA

Amended: Addendum

OPEN

SUBJECT CATEGORIES
» Research data
» Publication characteristics

Comment: The FAIR Guiding Principles for scientific data management and stewardship

Mark D. Wilkinson et al.*



Reusable

Making them easy to reuse in different settings

Clear usage license, accurate information on provenance

Open materials
ooooo

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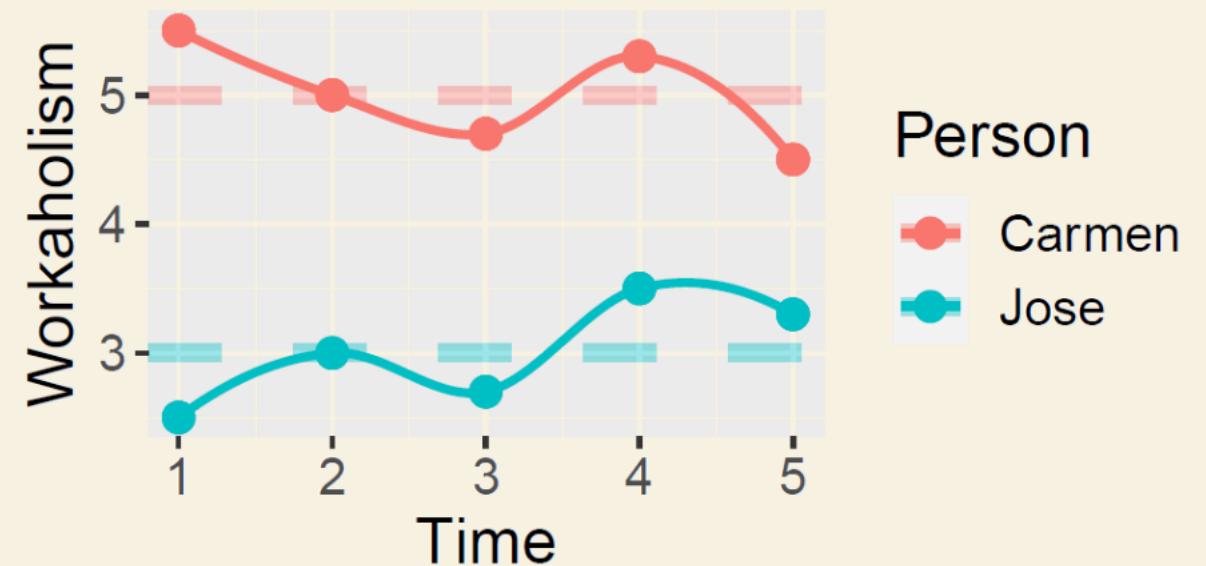
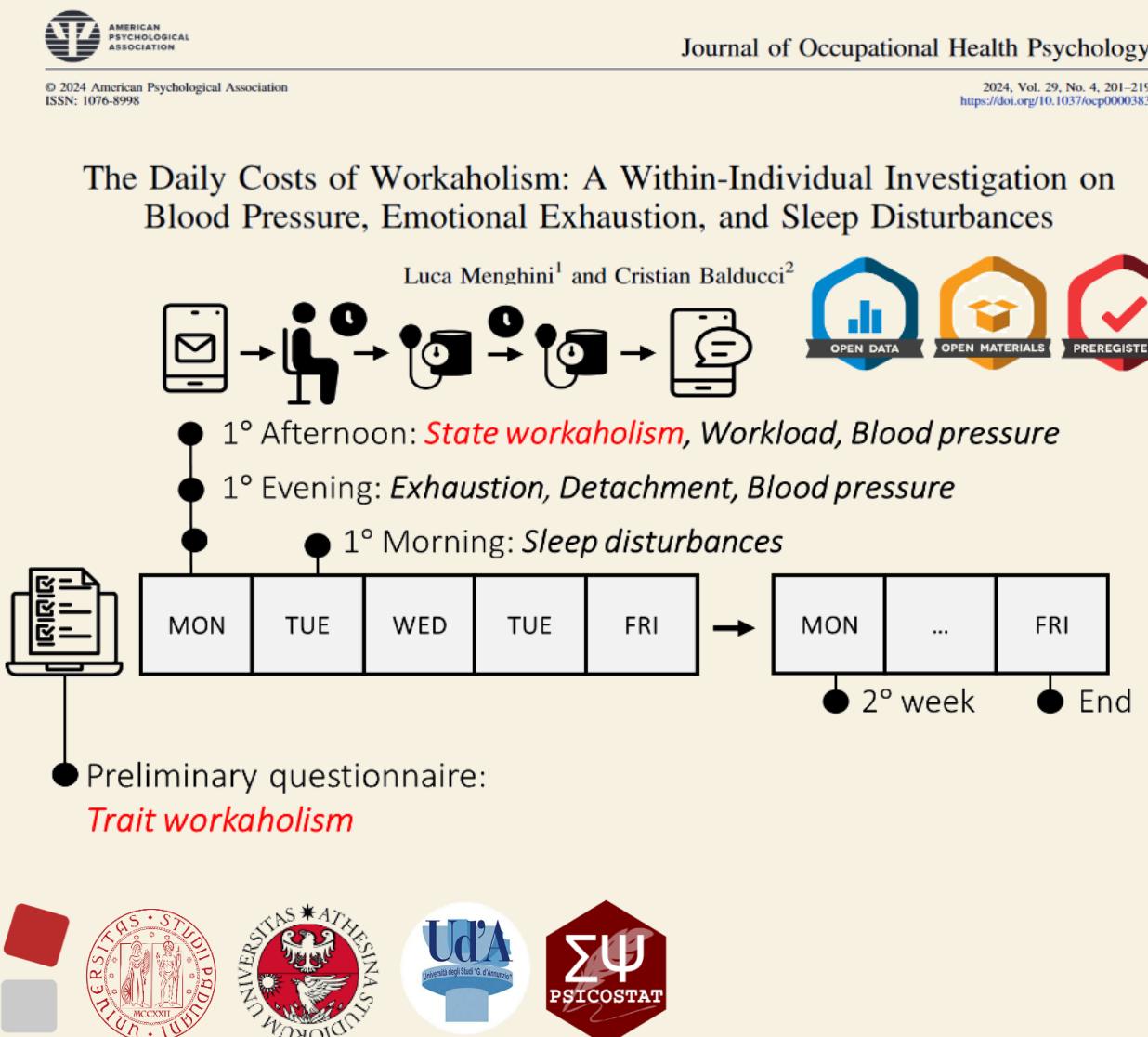
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Intensive Longitudinal Data

Umbrella term for multiple data sampling techniques (e.g. daily diary, ESM, EMA) typically involving **numerous data points** (e.g., 10-to-50) and **short time lags** (e.g., minutes, days, weeks) to capture temporal dynamics that cannot be unraveled with lower sampling rates

Bolger & Laurenceau (2013); Revelle & Wilt (2019)



→ Implying **greater dataset complexity** and requiring specific procedures to ensure acceptable data quality
e.g., handling missing data, merging multiple datasets, data centering procedures



ILD pre-processing tutorial

DOI [10.17605/OSF.IO/SXH4Q](https://doi.org/10.17605/OSF.IO/SXH4Q)

**International
Journal of Psychology**



Empirical Article | Open Access |

Manipulation of Intensive Longitudinal Data: A Tutorial in R With Applications on the Job Demand-Control Model

Luca Menghini, Enrico Perinelli, Cristian Balducci

First published: 23 March 2025 | <https://doi.org/10.1002/ijop.70040>

ID	time	day	beep	v1
S1	03/12/2018 10.22	1	2	4
S1	03/12/2018 12.05	1	3	3
S1	03/12/2018 13.27	1	4	2
S1	03/12/2018 18.00	1	7	2
S1	05/12/2018 11.56	2	3	3
S1
S1	25/01/2019 12.00	3	3	2
S1
S2	18/01/2019 09.15	1	1	3
...

ID	age	gender	v1_mean
S1	33	M	2.82
S2	29	F	2.93
S3
...

ID	day	beep	age	gender	v1	v1_mean	v1_cmc	v1_cmc_lag
S1	1	1	33	M	4	2.82	1.18	-
S1	1	2	33	M	3	2.82	0.18	1.18
S1	1	3	33	M	2	2.82	-0.82	0.18
S1	2	1	33	M	3	2.82	0.18	-
S1	2	2	33	M	1	2.82	-1.82	0.18
S1	2	3	33	M	3	2.82	0.18	-1.82
S2	1	1	29	F	3	2.93	0.17	-
...

1. Data reading

Reading, Merging,
Renaming

2. Temporal synch

Time formatting, Time
point identifiers

3. Data cleaning

Exclusion criteria,
Response rate & missing
data, Careless responses

4. Data merging

Unified dataset

5. Centering

Cluster mean & cluster-
mean-center.

6. Psychometrics

Level-specific corr. &
reliabilities, MCFA

7. Composite ind.

Aggregation procedures

8. Lagging/Leading

Moving variables forward
& backward within a
participant

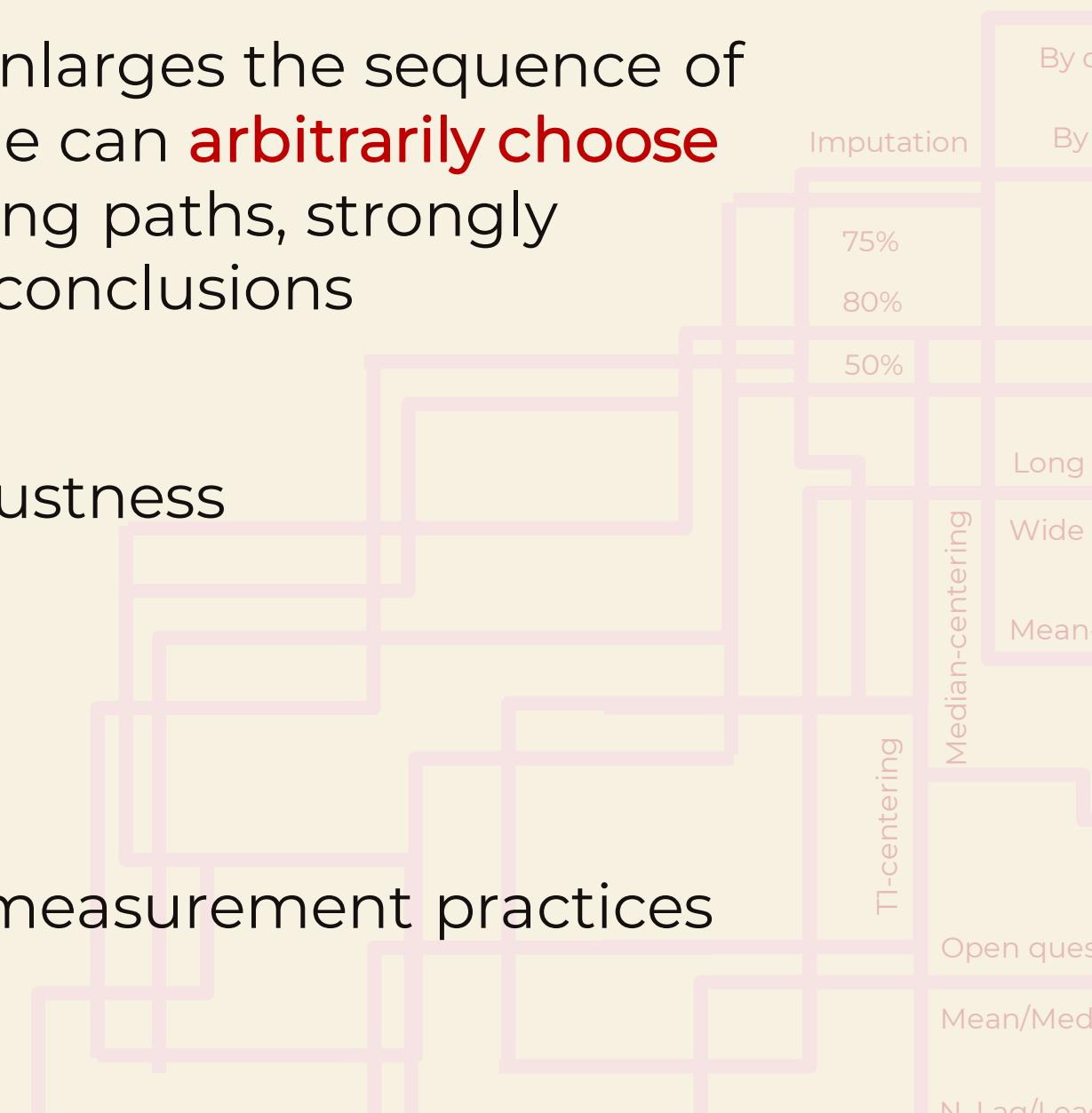


ILD data pre-processing: The garden of forking paths

Dataset complexity enlarges the sequence of procedures where one can **arbitrarily choose** among multiple forking paths, strongly impacting the study conclusions

Weermeijer et al. (2022)

- generalizability/robustness
- + % of making errors
- + % of p -hacking
- + % of questionable measurement practices



DOI [10.17605/OSF.IO/SXH4Q](https://doi.org/10.17605/OSF.IO/SXH4Q)

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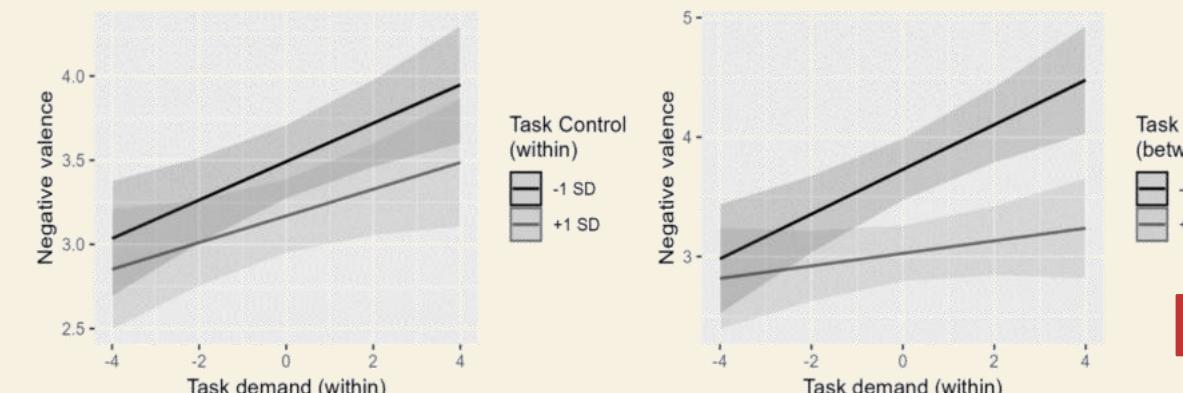
Moving variables forward
& backward
within a participant

Data analysis, Results, Conclusions

Multiverse of datasets

Rather than focusing on a single path of data manipulation, it is suggested to pre-process and analyze the data over a range of **reasonable ways** and discuss the **robustness** of the findings across the considered forking paths

data <chr>	N1 <int>	N2 <int>	m1.TDw <lgl>	m1.TCw <lgl>	m1.int <lgl>	m2.TDw <lgl>	m2.TCb <lgl>	m2.int <lgl>
1. Original	1379	121	TRUE	TRUE	FALSE	TRUE	TRUE	TRUE
2. All in	1600	166	TRUE	TRUE	FALSE	TRUE	TRUE	TRUE
3. 1st resp out	1144	108	TRUE	TRUE	FALSE	TRUE	TRUE	TRUE
4. 1st day out	930	126	FALSE	TRUE	FALSE	TRUE	TRUE	TRUE
5. 3+ obs/day	1013	82	TRUE	TRUE	FALSE	TRUE	TRUE	TRUE
6. 30% compl	1476	134	TRUE	TRUE	FALSE	TRUE	TRUE	TRUE
7. 70% compl	350	23	TRUE	TRUE	FALSE	FALSE	FALSE	FALSE
8. (4) & (7)	1268	124	TRUE	TRUE	FALSE	TRUE	TRUE	TRUE
19. (4) & (8)	216	14	TRUE	TRUE	FALSE	FALSE	FALSE	FALSE



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Data analysis, Results, Conclusions



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Multiverse analysis

- = Systematically evaluating the **robustness** of the results across the range of potentially relevant decisions
- = Systematic form of a **dependent reproducibility study** (same dataset, different analyses)

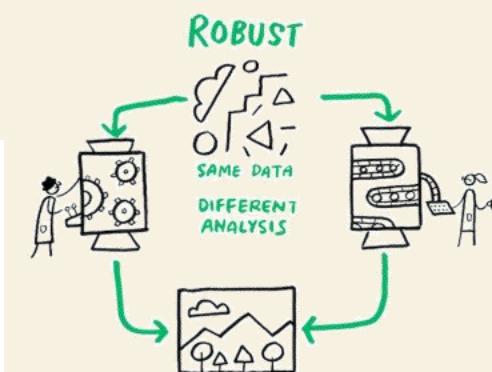
Journal of Applied Psychology

https://doi.org/10.1037/apl0001291

Do Not Put All of Your Eggs in One Basket: Multiverse Analysis in Applied Psychology

Jens Mazei¹, Cort W. Rudolph², Hannes Zacher³, and Joachim Hüffmeier¹

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ISSN: 0021-9010



Post-selection Inference in Multiverse Analysis (PIMA): An Inferential Framework Based on the Sign Flipping Score Test

Theory & Methods | Published: 25 April 2024

Volume 89, pages 542–568, (2024) Cite this article

Paolo Girardi, Anna Vesely, Daniël Lakens, Gianmarco Altoè, Massimiliano Pastore, Antonio Calcagni & Livio Finos

Behavior Research Methods (2024) 56:3346–3365
https://doi.org/10.3758/s13428-023-02172-8

Check for updates

First steps into the pupillometry multiverse of developmental science

Giulia Calignano¹ · Paolo Girardi^{1,2} · Gianmarco Altoè¹

Accepted: 14 June 2023 / Published online: 13 July 2023
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Increasing Transparency Through a Multiverse Analysis

Sara Steegen¹, Francis Tuerlinckx¹, Andrew Gelman², and Wolf Vanpaemel¹

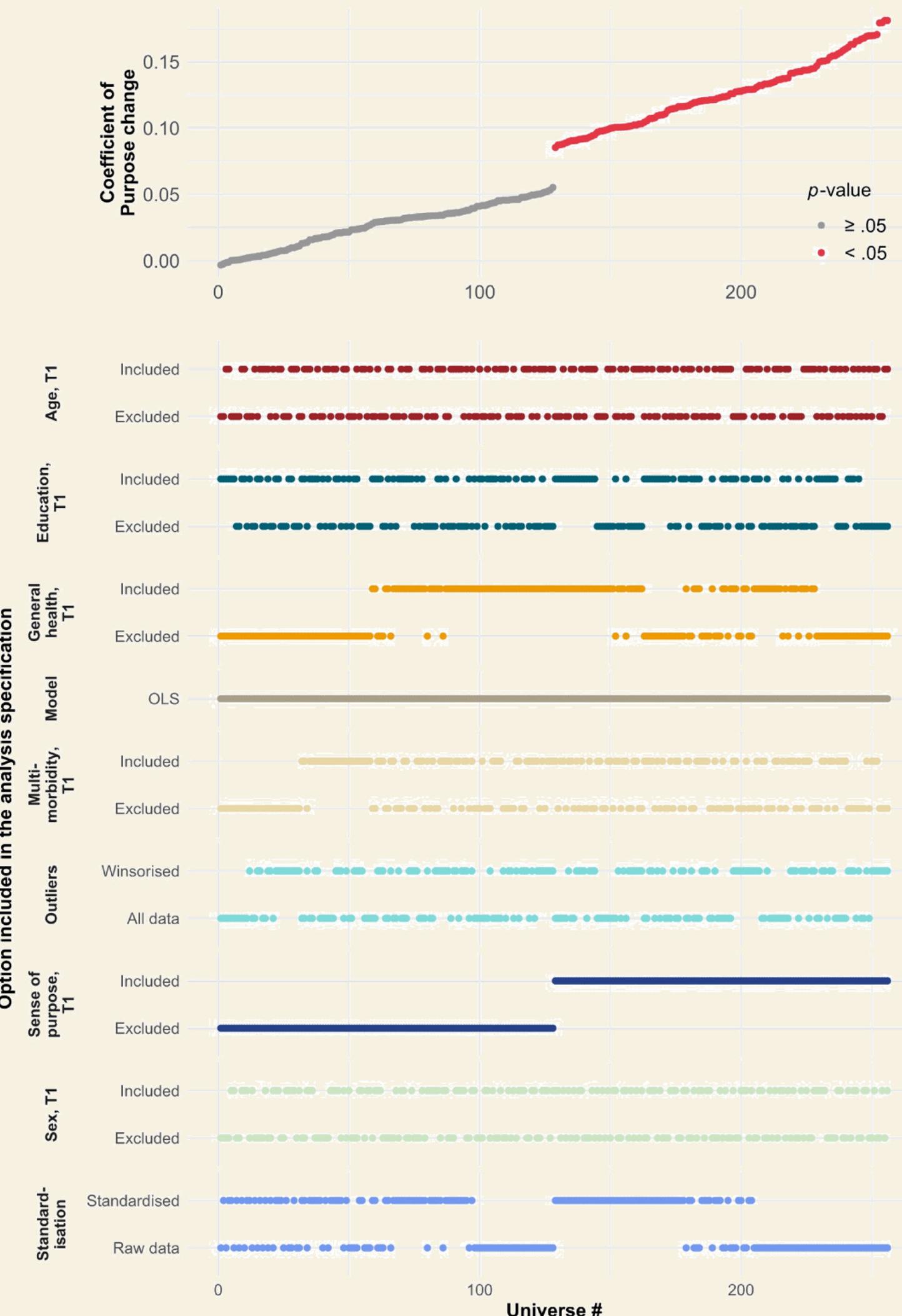
Perspectives on Psychological Science
2016, Vol. 11(5) 702–712
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DOI: 10.1177/1745691616658657
pp.sagepub.com

International Journal of Psychology

International Journal of Psychology, 2024
Vol. 59, No. 6, 1003–1014, DOI: 10.1002/ijop.13229

The multiverse of universes: A tutorial to plan, execute and interpret multiverses analyses using the R package multiverse

Martin Götz¹ · Abhraneel Sarma², and Ernest H. O'Boyle³



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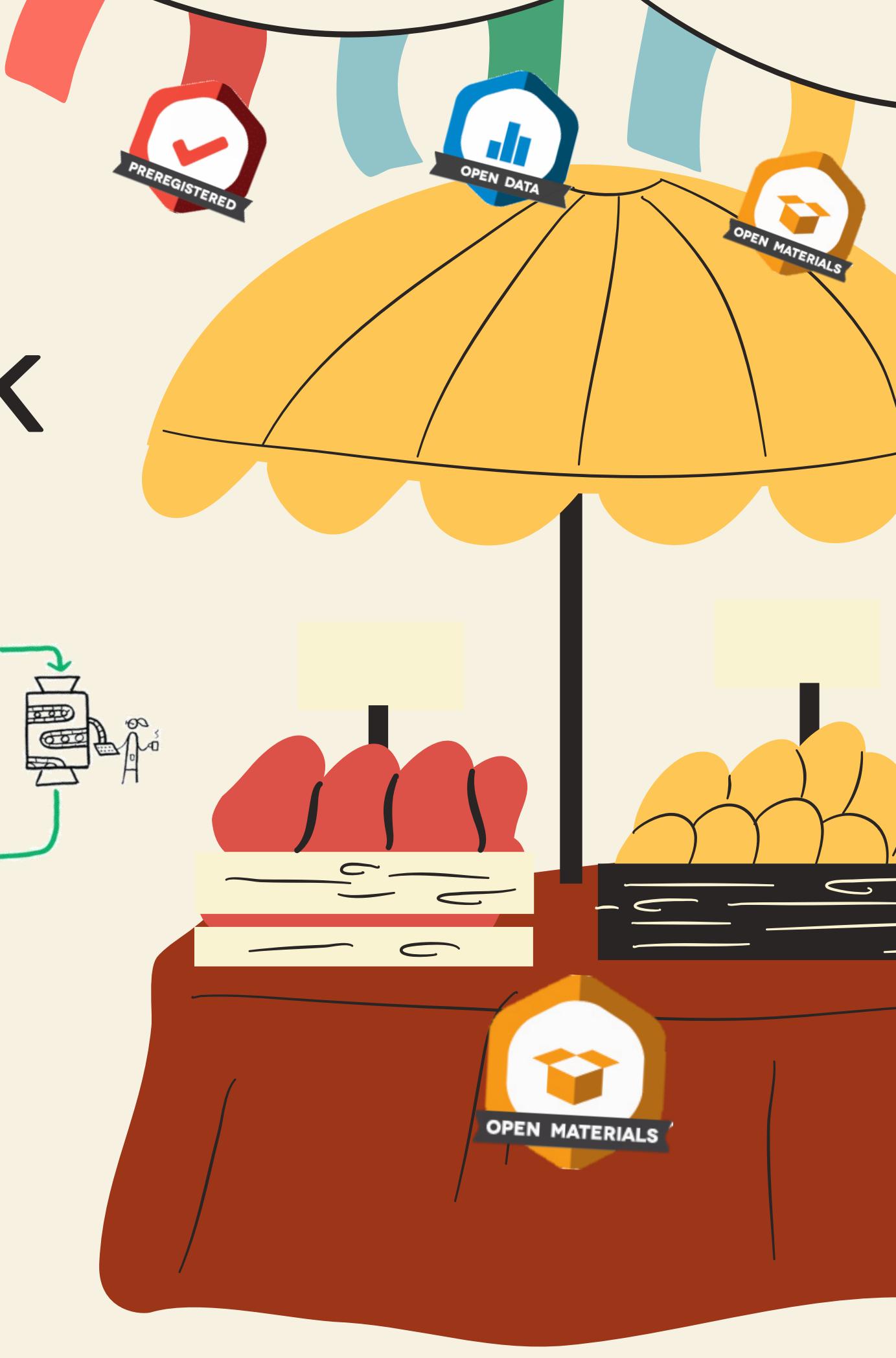
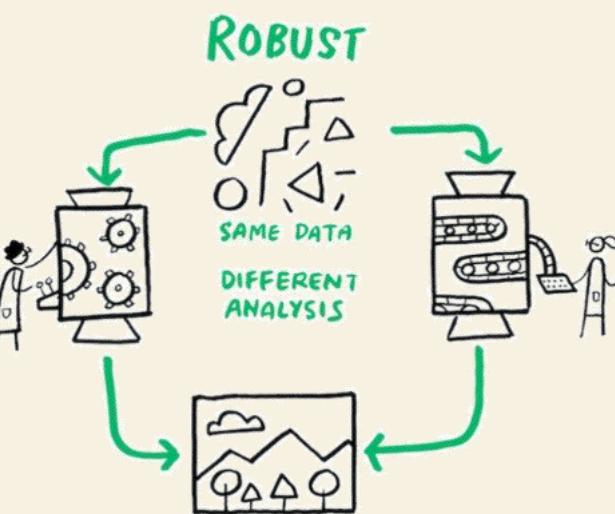
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Multiverse approach(es): You will never go back

- Data are not 'given' but constructed
Steegen et al (2016)
- Transparency is not enough,
we need **robustness**, accepting fragility
Calignano et al. (2024) Gelman et al (2017)
- Multi-verse × **Multi-lab**
Towards shared consensus on data processing pipelines
across lab-specific traditions
e.g. Sirois et al (2023)



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Towards more credible WOP research

Open science
Transparent and accessible knowledge shared and developed thought collaborative networks



Implications

- **Research:**
More credible science
- **Political:**
Neoliberal academy,
Publish-or-perish culture,
Quantitative performance
- **Organizational:**
QRPs as counterproductive work behaviours
 - **Secondary prevention:** Incentives (badges, etc.)
 - **Primary prevention:** Cultural change, More focus on qualitative performance



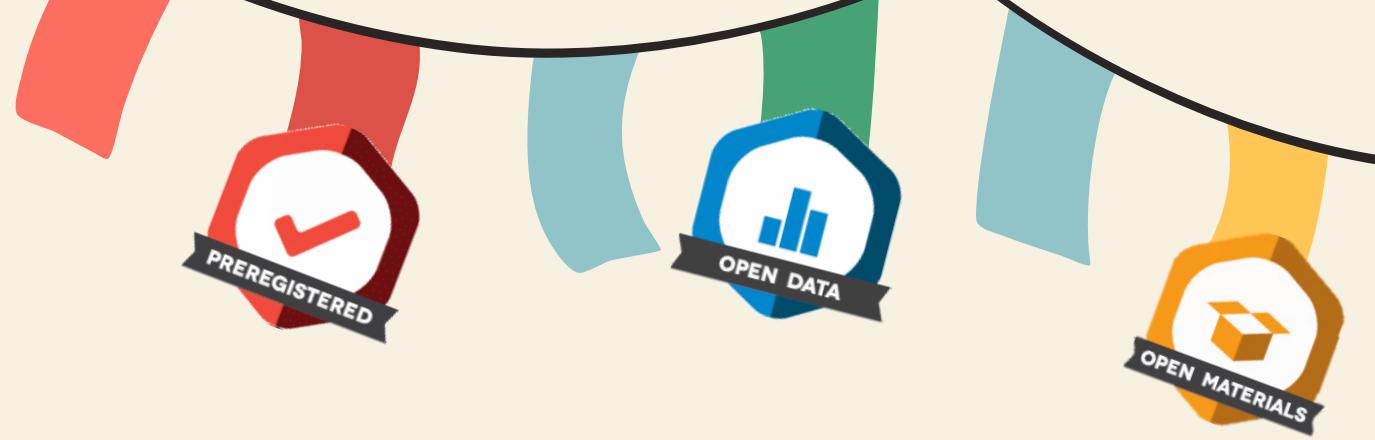
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ooo

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ooo

The importance of (FAIR) open materials



- **No more excuses**
No privacy issues, open platforms to share version controlled code (e.g. GitHub), open tools for embedding text, code, and outputs (e.g. RMarkdown, Jupyter Notebook)
- **Materials as citable knowledge resources**
Items, stimuli, code, supplementary analyses to be reused by the community
- **Yet, still poorly adopted and encouraged**
Mentioned by only 23-to-43% of IOP/Management journals
Torka et al. (2023)



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Multiverse
ooo

Discussion
oooo

Even better than multiverse: Thinking before testing

Transparency is not enough,
we need a-priori planning of HP & analyses
→ Preregistration & Registered reports



Here, check our
numbers.



Here's how you
can replicate our
result.



100% P-hacking Free



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oooo

Psicostat research group



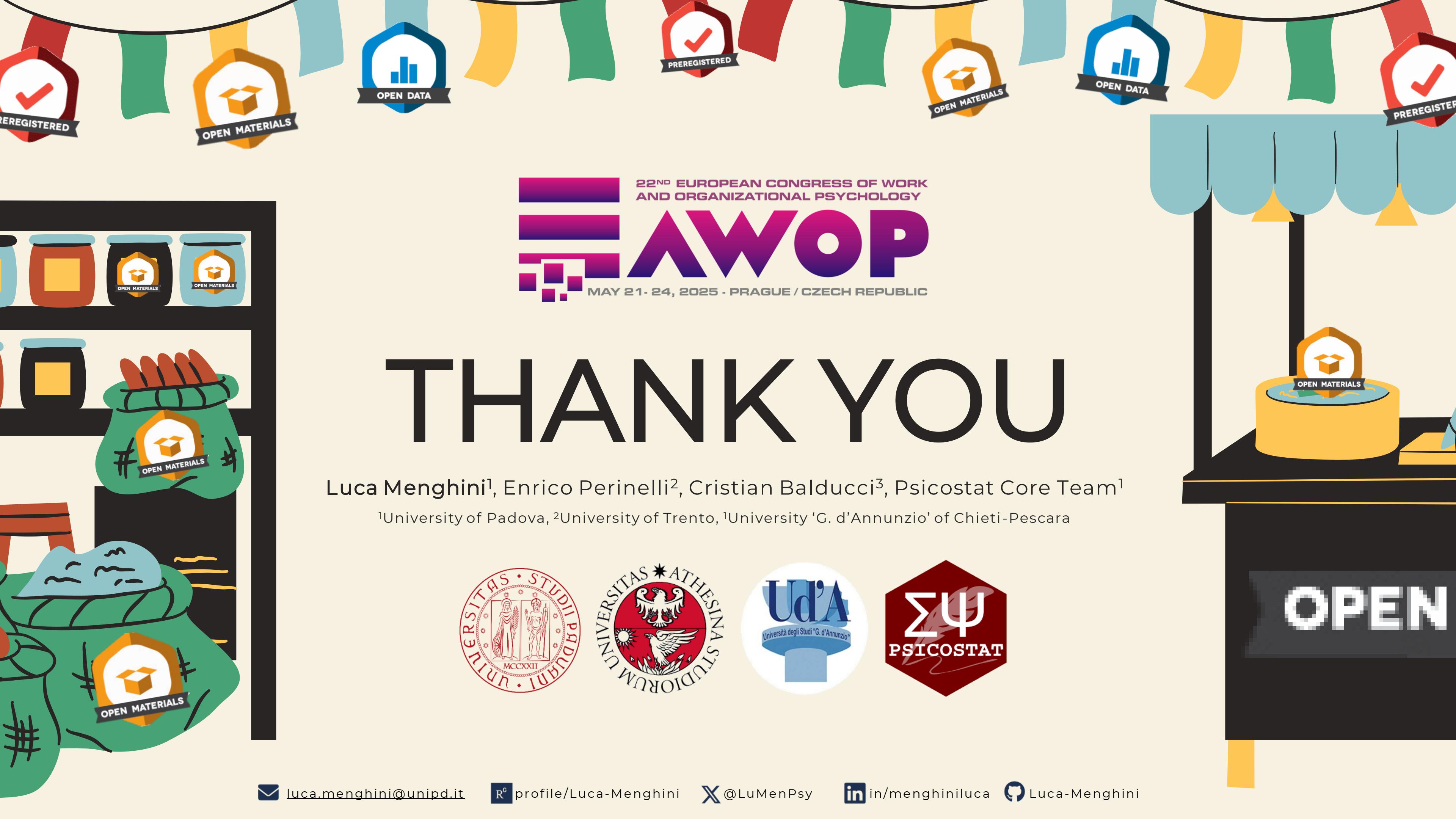
Interdisciplinary research group in
quantitative psychology, psychometrics,
psychological testing, & statistic

University of Padova (Italy)

<https://psicostat.dpss.psy.unipd.it/>

Monthly online meetings around
methodology and open science in
psychological sciences:





THANK YOU

Luca Menghini¹, Enrico Perinelli², Cristian Balducci³, Psicostat Core Team¹

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