A Meta-Analysis Synthesizing 20 Years of Evidence on the Balloon Analogue Risk Task (BART)

RENATO FREY, MAUE PANTOJA & AARON B. LOB

COGNITIVE AND BEHAVIORAL DECISION RESEARCH | DEPARTMENT OF PSYCHOLOGY | UNIVERSITY OF ZURICH | CBDR-LAB.NET

Universität Zürich[UZH]

Pre-print notification:

https://cbdr-lab.net/pantoja
maue.pantoja@psychologie.uzh.ch

Background & Objectives

With over 3,000 citations, the BART [1] remains a state-of-the-art measurement instrument. Despite its popularity, this task has only been the subject of a limited degree of systematic and rigorous validation research. One possible reason for this may be that the BART has been implemented flexibly, hindering cumulative scientific development [2]. Thus, we pursued the following two objectives:

A. Meta-analyze the test-theoretic properties of the BART:

- Test-retest reliability
- Association with other risk-taking measures
- Association with real-life risk taking
- Plus three further research questions

B. Assessment of measurement flexibility

Methods

Data:

- Studies: N = 296
- Extracted effect sizes: N = 1,960

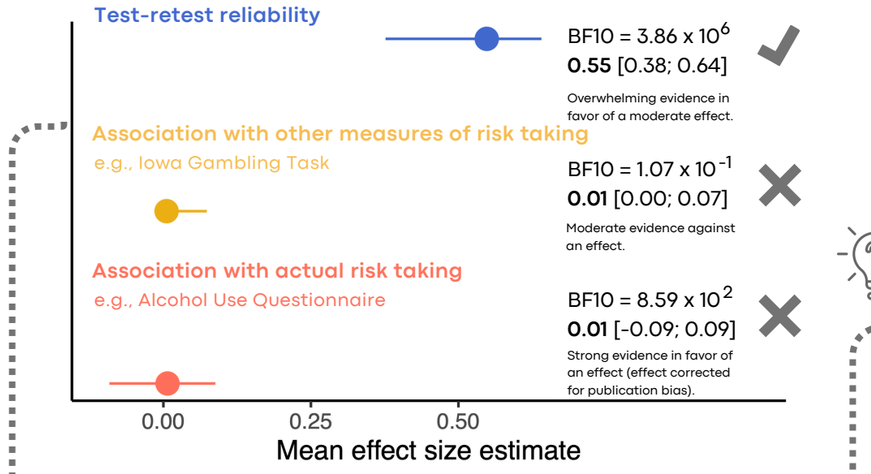
Modeling framework:

- Robust hierarchical Bayesian model-averaging meta-analysis framework [3].
- Combines models with different assumptions on the presence vs. absence of different components: (1) Effect, (2) heterogeneity, (3) dependency of effect sizes from the same publication, (4) publication bias, and (5) moderators accounting for measurement flexibility.
- Model space: Up to 3,072 models for each analysis.

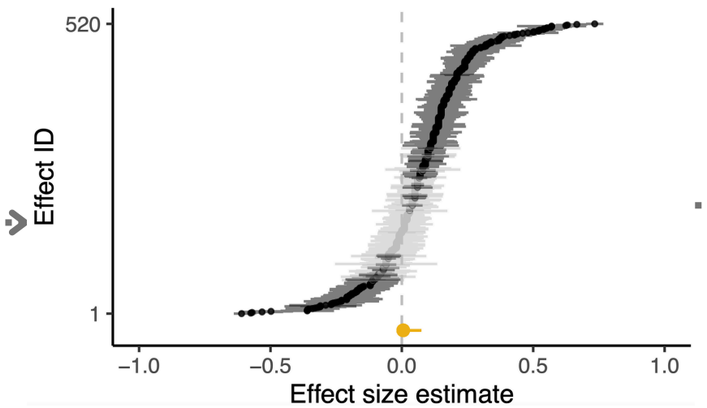
Results

A. Test-theoric properties of the BART

A1. Mean effect size estimates:



A2. Effect size estimates for the association with other risk-taking measures:

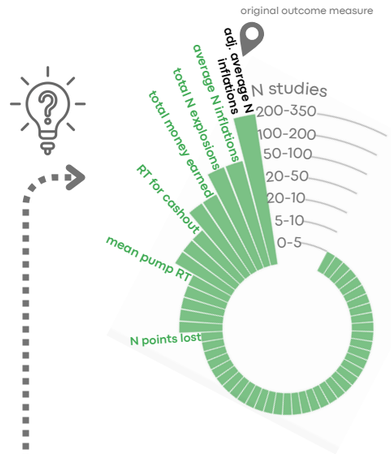


Effect size estimates vary considerably across studies.

B. Assessment & impact of measurement flexibility

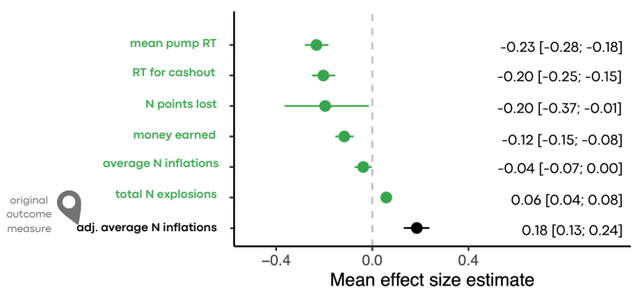
We assessed the moderating role of flexibility regarding eight task and study characteristics (e.g., the outcome measure of the BART, the number of trials, or the study population) on the mean effect size estimate.

B1. Illustration of measurement flexibility (outcome measure):



27 different outcome measures of the BART (i.e., the scoring method used to quantify participants' BART performance such as the adjusted BART score) have been used across all analyzed studies, illuminating a substantial measurement flexibility.

B2. Impact of measurement flexibility:



For six out of 18 alternative BART outcome measures, we found credible evidence of a difference from the original outcome measure.

The evaluation of the basic test-theoric characteristics of the BART calls into question whether the BART accurately measures risk-taking tendencies.

The meta-analytic effect of the BART differs depending on how the task is implemented. This pattern was observed for 6 out of 8 moderators (i.e., BART implementation).

References

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3. Bartoš, F., Maier, M., Wagenmakers, E.-J., Doucouliagos, H., & Stanley, T. D. (2023). Robust Bayesian meta-analysis: Model-averaging across complementary publication bias adjustment methods. Research Synthesis Methods, 14 (1), 99–116. https://doi.org/10.1002/jrsm.1594