UNIVERSITY OF MANNHEIM
School of Social Sciences

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EXPERIMENTAL PSYCHOLOGY LAB

Assessing Participants' Knowledge about the Distribution of Real-World Quantities

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Theoretical Background

Brown & Siegler (1993) proposed that people rely on metric knowledge when estimating real-world quantities (e.g., country populations). [1]

Definition of Metric Knowledge: Statistical properties of a domain such as *mean*, *variance*, and *form of distribution*. [1]

Multiple studies have shown that knowledge updating through **Seeding** (i.e., exposure to representative numerical facts about a domain) can improve metric knowledge and enhance estimation accuracy.[e.g., 1,2,3,4,5,6]

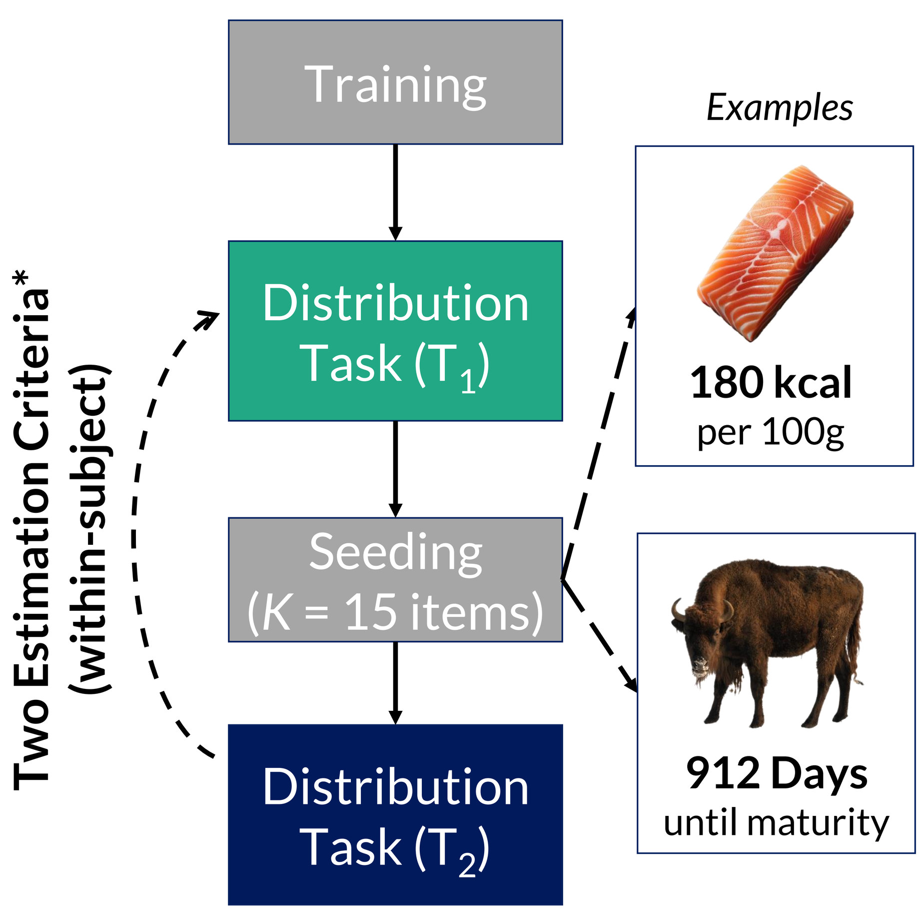
This Project

Limitations of Existing Measures: Traditional measures rely on item-wise deviations (e.g., absolute error, order of magnitude error), which fail to capture participants' grasp of the full distribution.

New Task for Distributional Knowledge: Assess participants' metric knowledge of a domain's full distribution in a more intuitive and flexible manner.

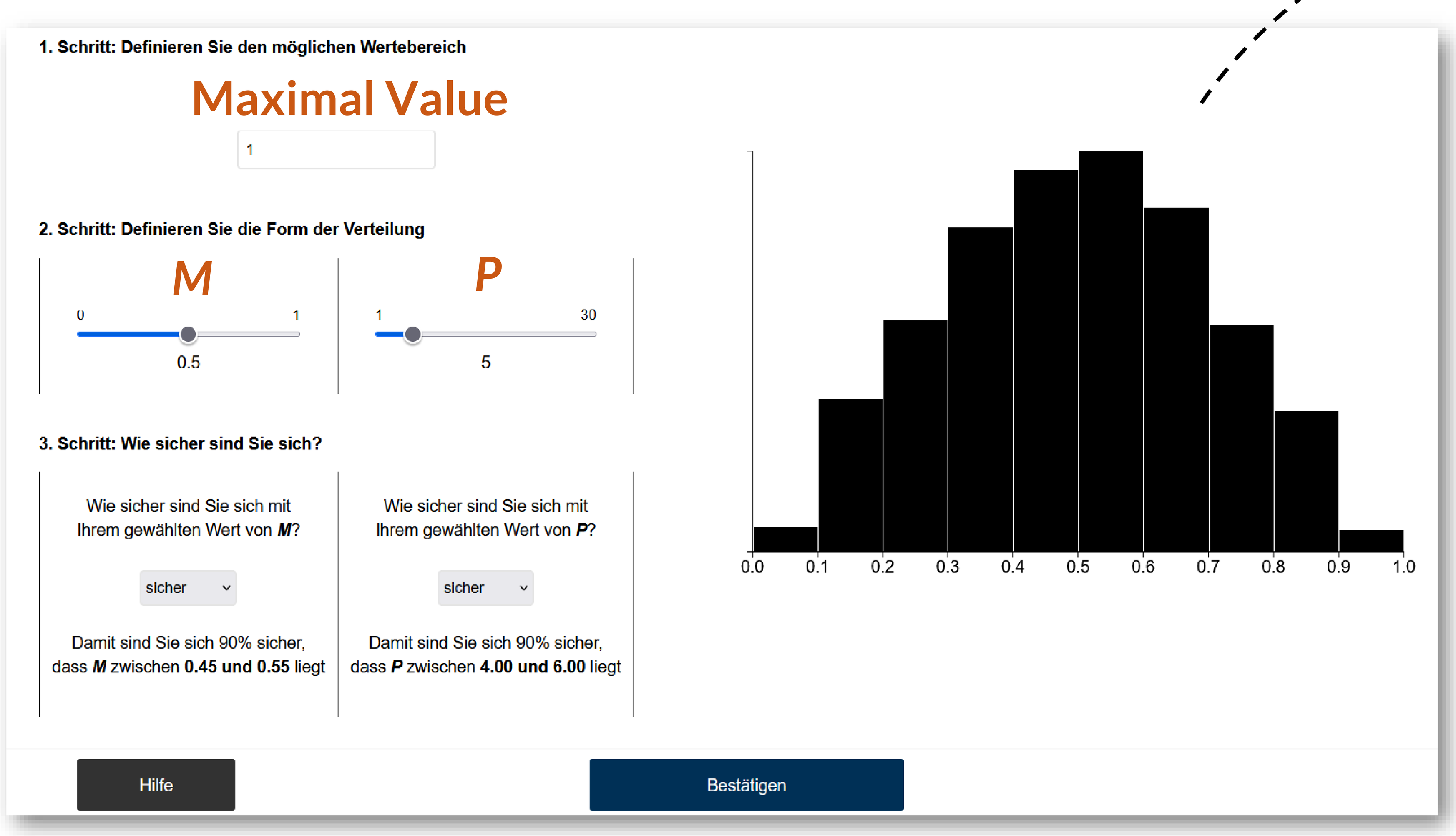
Method

Procedure:



*__Days__ until female maturity in mammals
Calories per 100g in food item

Distribution Task Screen



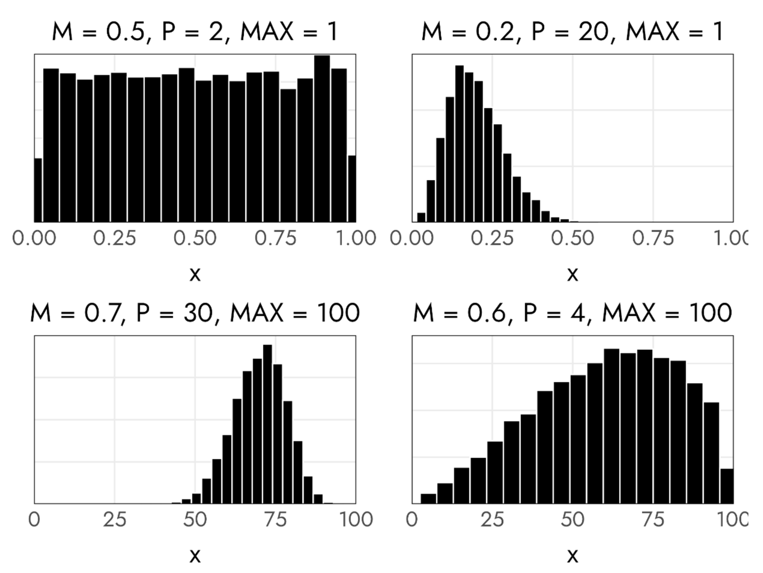
N = 30; 77 % female; M_{age} = 23.7 (4.0) years

Underlying Distribution is a **reparameterized scaled** ***Beta-Distribution***:

$$\alpha = M \cdot P \qquad \beta = (1 - M) \cdot P$$

$$Beta(\alpha, \beta) \cdot MAX$$

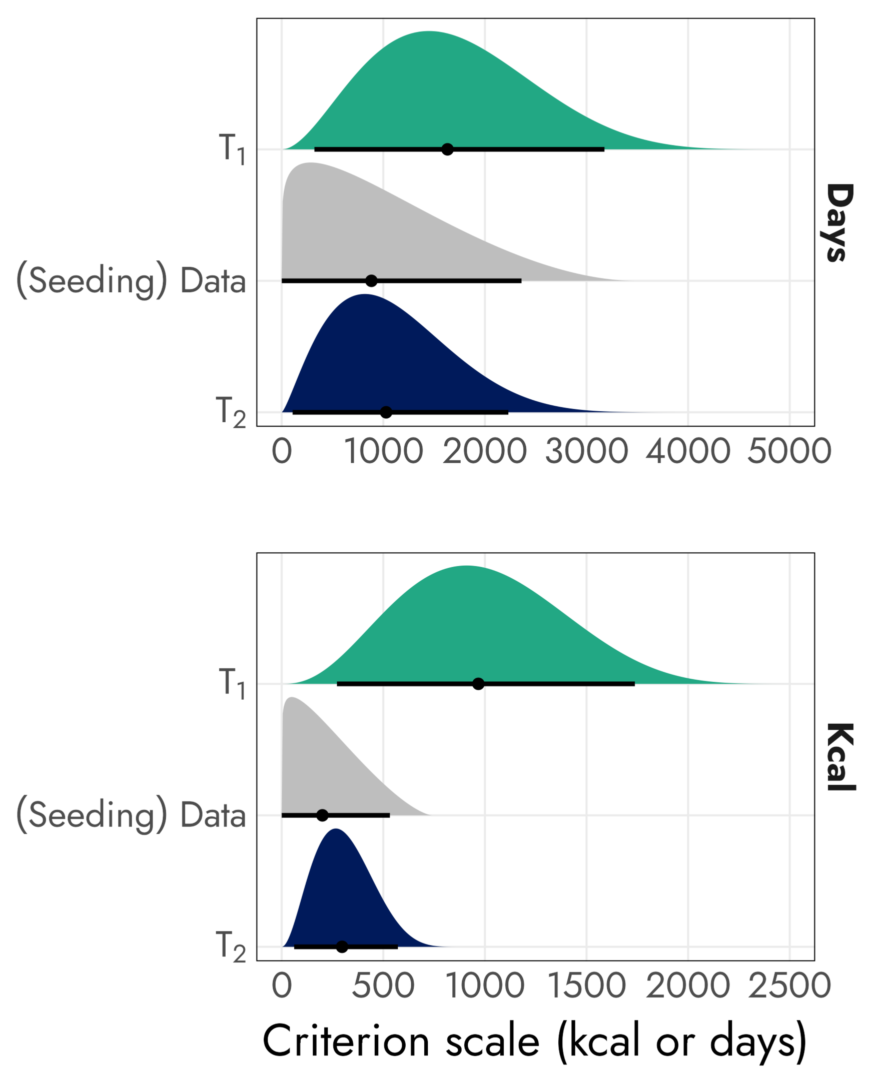
Examples:



Results

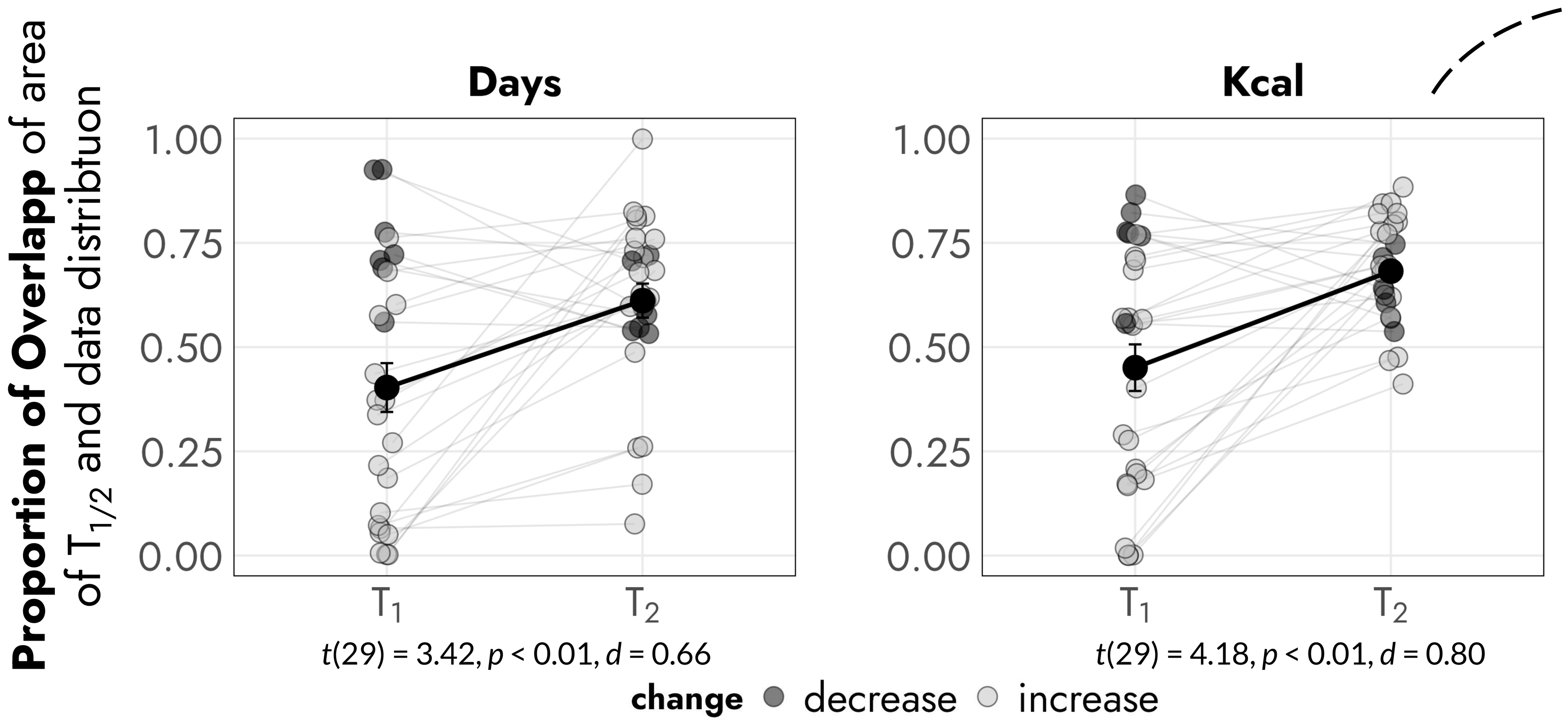
Average Updating of Metric Knowledge

Distributions based on average parameter values for *M*, *P*, *MAX*

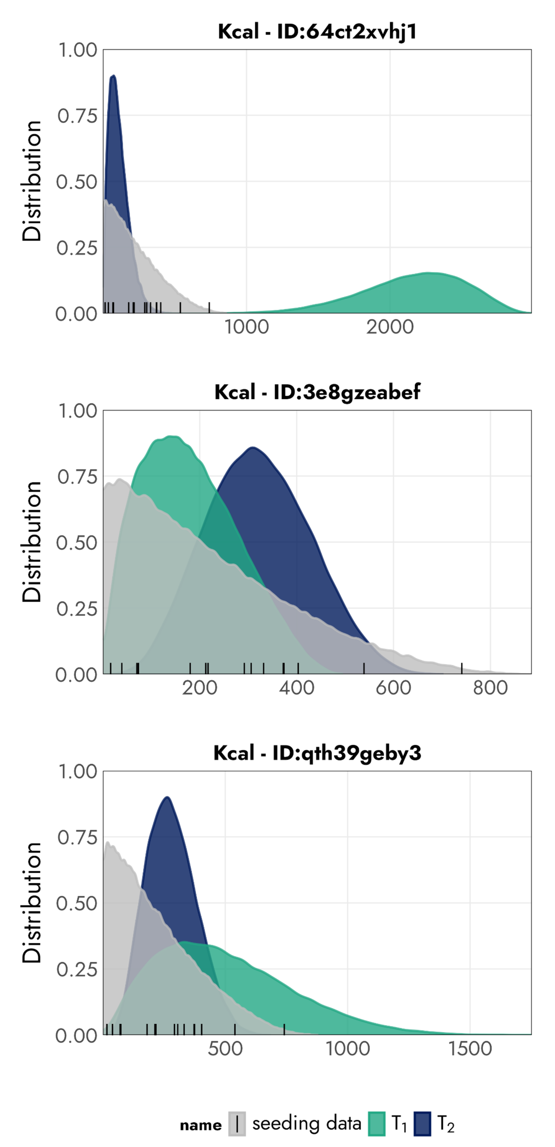


Individual Updating of Metric Knowledge

Based on proportion of overlap between data & estimated distributions as defined by parameters *M*, *P*, *MAX*



Individual Examples



Discussion

Distribution tasks captures updating metric knowledge expected by seeding

Next steps:

- Comparison to expected normative updating under Bayes Rule (i.e., Posterior)
- Relationship to estimation accuracy for individual items
- Moderating effects of personality variables (memory measures, processing speed, numeracy etc.)

Poster

Literature:

[1] Brown, N. R., & Siegler, R. S. (1993). Metrics and mappings: A framework for understanding real-world quantitative estimation. *Psychological Review*, *100*(3), 511–534.

[2] Groß, J., Kreis, B. K., Blank, H., & Pachur, T. (2023). Knowledge updating in real-world estimation: Connecting hindsight bias and seeding effects. *Journal of Experimental Psychology: General*.

[3] Groß, J., Loose, A. M., & Kreis, B. K. (2023). A simple intervention can improve estimates of sugar content. *Journal of Applied Research in Memory and Cognition*.

[4] Bröder, A., Dülz, E., Heidecke, D., Wehler, A., & Weimann, F. (2023). Improving carbon footprint estimates of food items with a simple seeding procedure. *Applied Cognitive Psychology*, *37*(3), 651–659.

[5] Wohldmann, E. L. (2013). Examining the relationship between knowing and doing: Training for improving food choices. *The American Journal of Psychology*, *126*(4), 449–458.

[6] LaVoie, N. N., Bourne, L. E. Jr., & Healy, A. F. (2002). Memory seeding: Representations underlying quantitative estimations. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *28*(6), 1137–1153.