# Two Studies, one Result: Student Teachers are Biased by Anchors When Engaging With Evidence

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# Evidence-Informed School Practice

# Evidence-Informed School Practice

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- Teachers are encouraged to consider a great variety of evidence ranging from formal or informal generated raw data to results of educational research in their professional actions (European Commission of the European Communities, 2007; Schildkamp, 2019).

- Both concepts, data-based decision-making and research-informed educational practice, can be combined under the overarching approach of evidence-informed practice (Brown et al., 2017; Brown et al., 2022).

- Advantages of data-based decision-making (Mandinach & Schildkamp, 2021):
  - Individual data basis
  - Reactions to the subjective needs of the students as well as the specific school situations

- Advantages of research informed educational practice (Bromme et al., 2014; Flood & Brown, 2020; Stark, 2017):
  - As an external input
  - Critical reflection on professional actions
  - Legitimation and justification of decisions

# Anchoring Effects ⚓

# Anchoring Effects ⚓

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- Anchoring = a numeric judgment is assimilated to a previous known standard (Mochon & Frederick, 2013; Tversky & Kahneman, 1974)
- The effect occurs because of the scale distortion caused by the anchor (Mochon & Frederick, 2013)
- Some results of previous research:
  - Anchoring effects can be found even after a longer period of time (Mussweiler, 2001; Yoon & Fong, 2019)
  - Expertise does not necessarily prevent from Anchoring (Dünnebier et al., 2009)
  - Relevant anchors lead to larger effects than random anchors (Röseler et al., 2022)
- "A better understanding of these heuristics and of the biases to which they lead could improve judgments and decisions in situations of uncertainty". (Tversky und Kahneman, 1974, p. 9)

# Study 1: Anchoring Effects in Engagement with Data

# Sample

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*N* = 68 student teachers from the Karlsruhe University of Education

- 70.59 % female student teachers
- $M_{semesters}$ = 4.73 (*SD* = 3.02)
- 69.12 % of the students studied at least one STEM subject

# Design and Materials

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Randomized Controlled Trial with two experimental groups: *small anchor* and *small to large anchor*

# Design and Materials

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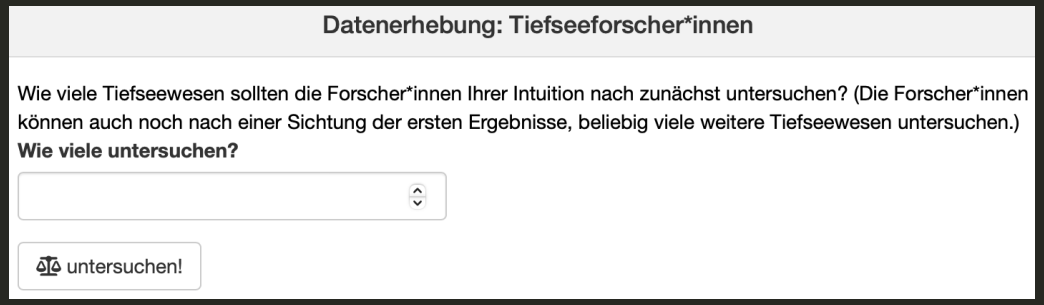
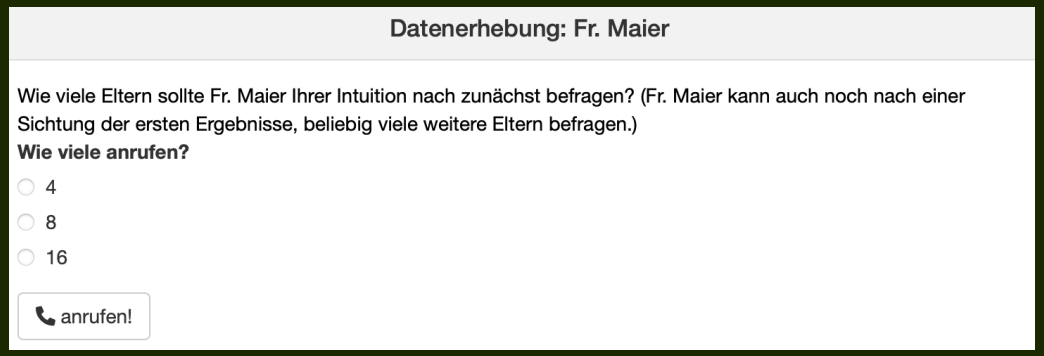
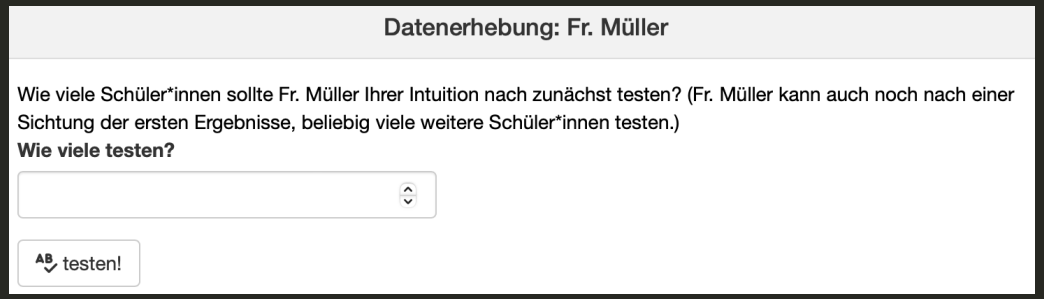



Virtual experiment 1 - open text box




Virtual experiment 2 - Intervention group 1 with small sampling options




Virtual experiment 3 - open text box

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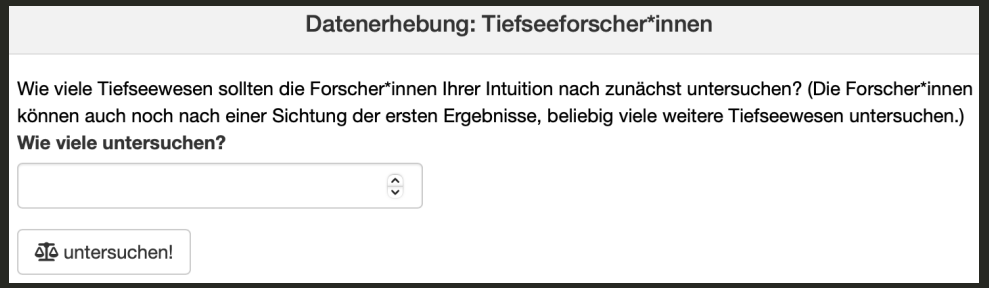
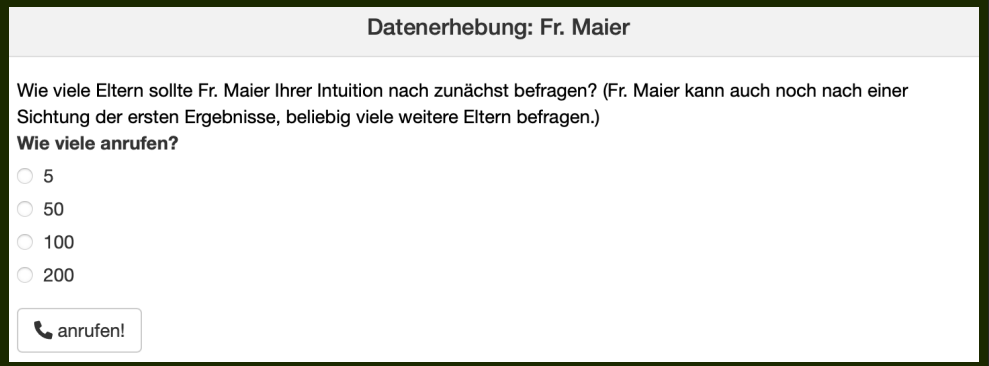
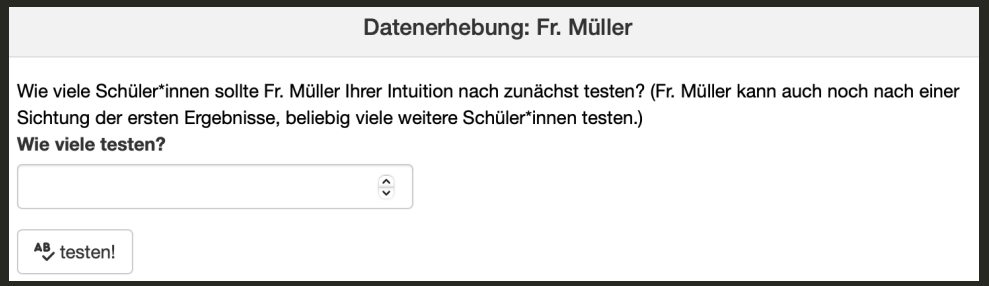



Virtual experiment 1 - open text box




Virtual experiment 2 - Intervention group 2 with small to large sampling options




Virtual experiment 3 - open text box

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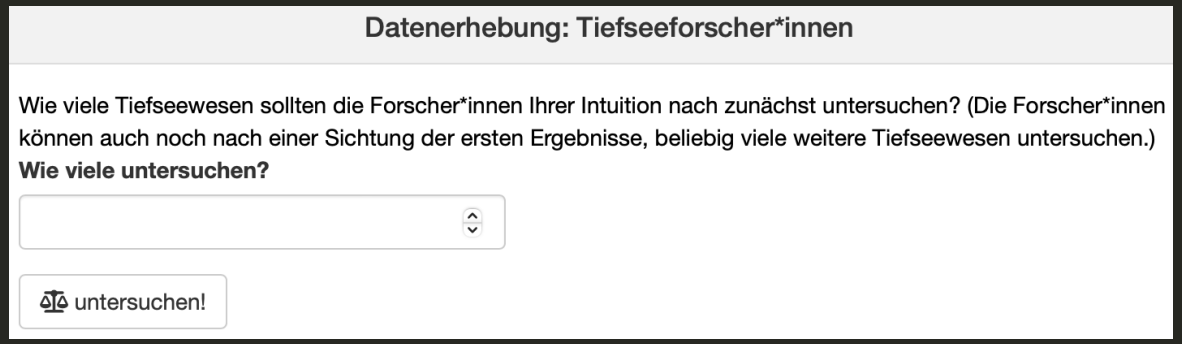
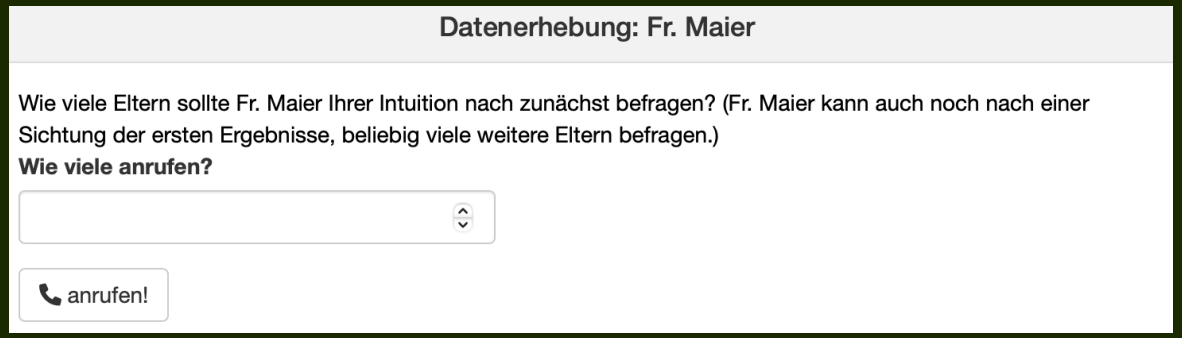



Virtual experiment 1 - open text box




Virtual experiment 2 - Control group with open text box

Virtual experiment 3 - open text box

# Design and Materials

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Randomized Controlled Trial with two experimental groups: *small anchor* and *small to large anchor*

# Hypotheses

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$H_1$: Small sampling options in the second experiment (working as a small anchor) are leading to smaller initial samplings in the third experiment than small to large sampling options (working as a small to large anchor).

$H_2$: Small sampling options in the second experiment (working as a small anchor) are leading to smaller maximum samplings in the third experiment than small to large sampling options (working as a small to large anchor).

$$H_1: \mu_{small\ samples} < \mu_{small\ to\ large\ samples}$$
$$H_2: \mu_{small\ samples} < \mu_{small\ to\ large\ samples}$$

# Results

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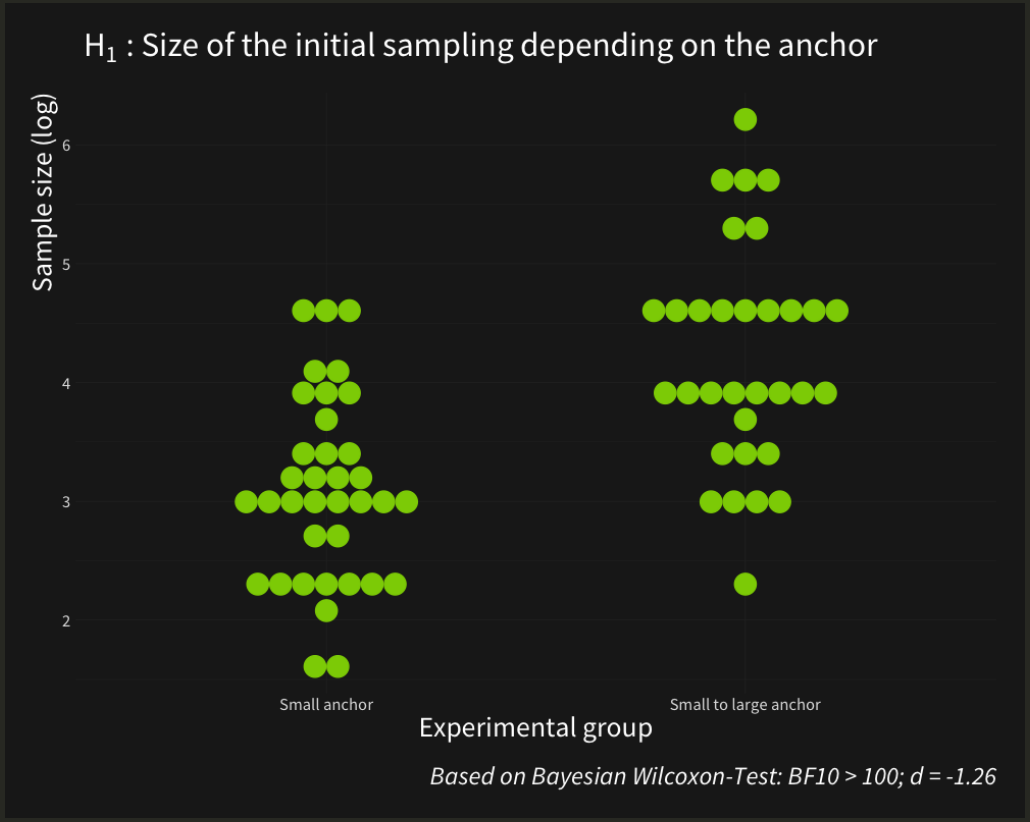


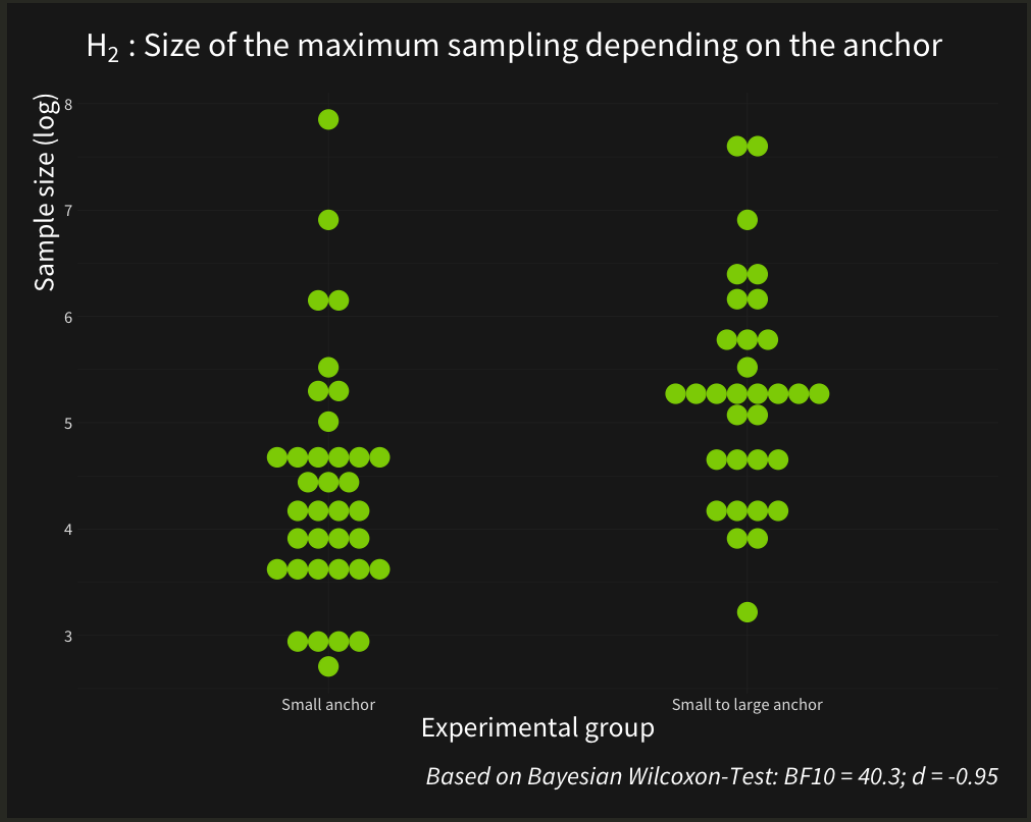

# Study 2: Anchoring Effects in Interpreting Scientific Evidence

# Sample

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*N* = 233 student teachers from the Karlsruhe University of Education

- 85 % female student teachers
- $M_{semesters}$ = 3.36 (*SD* = 1.28)
- 70.81 % of the students studied at least one STEM subject

# Design and Materials

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Randomized Controlled Trial with two within-person factors *topic of educational research* and *sample size*

Below you will find a brief study description. Please read it carefully and then answer the following questions.

Study description:

*A group of educational researchers asks whether discovery learning (e.g., students conduct their own research on scientific issues, conduct experiments, interpret the results) enables more effective learning. Therefore, they investigates whether students learn better in a lesson with discovery learning than students in a teacher-centered lesson (direct instruction by the teachers, e.g. experiments are demonstrated by them).*
*For this purpose, they conduct the following experiment: The researchers randomly select two groups with N = 15 students each. One group attends a lesson with discovery learning on the topic "astronomy", the other group attends a teacher-centered lesson on the same topic. After the resepctive lesson, students take a test to check how much they have learned on the topic of astronomy.*

**What do you think?**
The described approach is suitable to answer the research question.

*totally disagree* *totally agree*

The number of sampled students (N = 15 in each group) in the presented study is appropriate to answer the research question.

*totally disagree* *totally agree*

# Design and Materials

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**What do you think?**
The described approach is suitable to answer the research question.

*totally disagree* _____ *totally agree*

The number of sampled students (N = 15 in each group) in the presented study is appropriate to answer the research question.

*totally disagree* _____ *totally agree*

# Hypothesis

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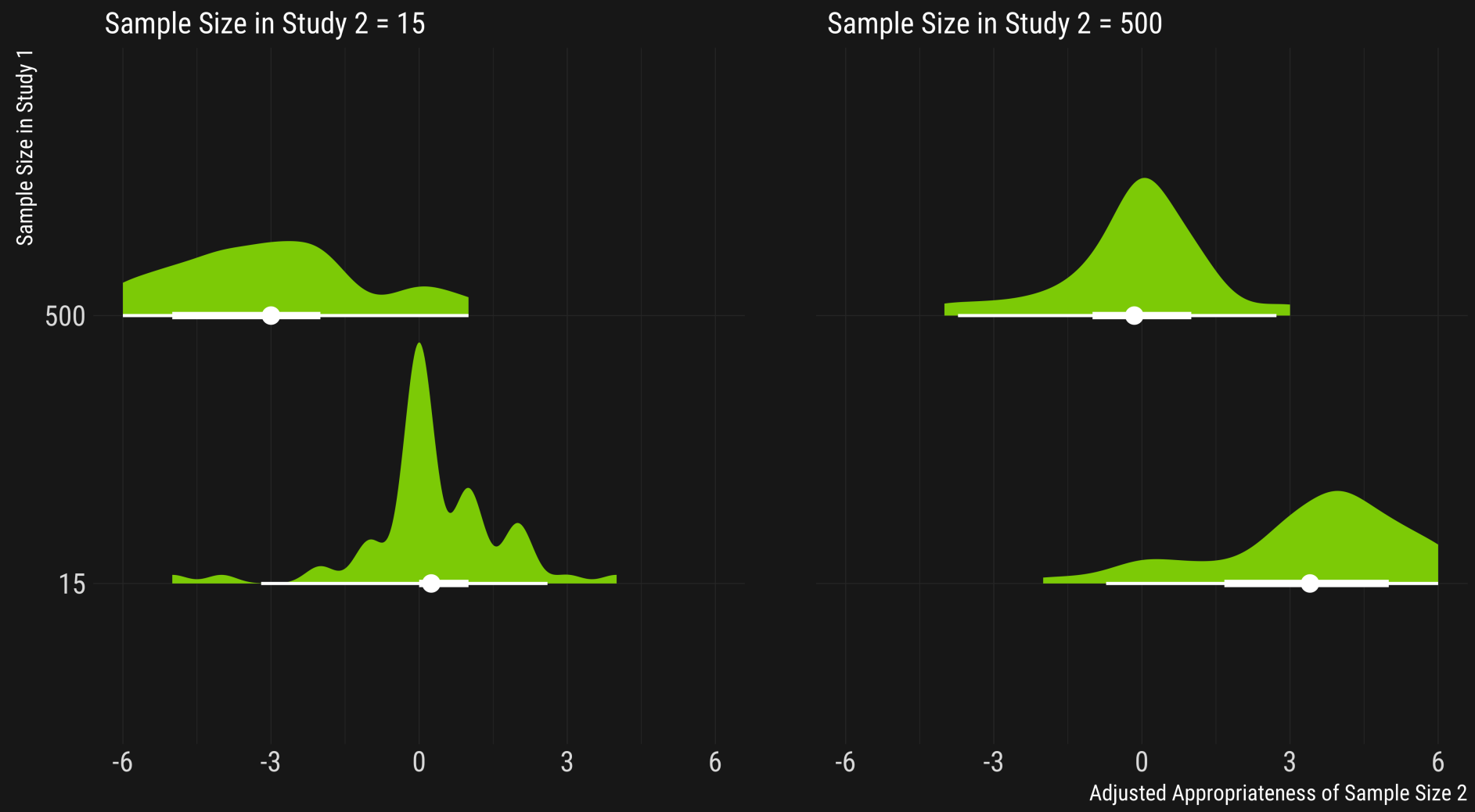
a) Taking into account the appropriateness rating of sample size 1, the experimental group 1 rates the presented sample size 2 as more appropriate than the experimental group 2.
b) Taking into account the appropriateness rating of sample size 1, the experimental group 2 rates the presented sample size 2 as less appropriate than the experimental group 1.
c) Taking into account the appropriateness rating of sample size 1, there is no difference in the appropriateness rating of sample size 2 between the control group 1 and control group 2.

$$H_1: \mu_{EG1} > \mu_{EG2} \ \& \ \mu_{CG1} = \mu_{CG2}$$

experimental group 1 (EG1): $N_1$=15 (small anchor), $N_2$=500
experimental group 2 (EG2): $N_1$=500 (large anchor), $N_2$=15
control group 1 (CG1): $N_1$=15, $N_2$=15
control group 2 (CG1): $N_1$=500, $N_2$=500

# Graphical Overview of the Results




Based on Bayesian ANOVA: BF10>100

# Discussion

# Discussion

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- DBDM and RIEP are supposed to be objective methods.
- Both studies indicate evidence for anchoring effects on student teachers' engagement with different types of evidence.

Anchoring effects in data-based decision-making

- Benchmarks in national tests (e.g., statewide assessments) might act as an anchor for interpreting the achievement of one's own students resulting in different teaching practices
- E.g., teaching to the test (Garner et al., 2017)

Anchoring effects in interpreting scientific evidence

- Large-scale assessments (e.g., PISA) might act as an anchor resulting in a devaluation of scientific evidence based on smaller sample sizes
- → sample sizes are not the only indicator of quality and validity

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# Thank you for your attention!

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