Technical University of Dortmund
Faculty of Statistics
Doebler/Ravi

**Case Studies I**
Summer Semester 2025
May 12, 2025

# Project 2: Comparison of $k$ Distributions Using the Example of an Anchoring Effect Experiment

## Background

The anchoring effect describes the tendency of individuals to base their numerical estimates on previously presented numbers, even if those numbers are obviously far from plausible values. For example, participants estimate Mahatma Gandhi's age significantly higher when told that the oldest person in his birth cohort lived to be 117, compared to when they are told the average age of all men from his cohort was 51. The anchoring effect is especially relevant in negotiation situations, as it has been shown to influence price determination as well as the length of prison sentences.

Janiszewski and Uy (2008)[1] examined additional factors influencing laypeople's numeric estimates in an experiment. In a questionnaire study, they asked students to make numeric estimates below a given anchor value. For example, participants were asked to estimate the protein content of sports nutrition drinks, with the manufacturer stating "less than 10g of protein per drink." The authors varied the *precision of the numerical anchor* (e.g., 10g vs. 9.8g), as well as the *motivation* to underestimate (e.g., using phrases such as "just below 10g" vs. "below 10g"). Multiple questionnaires were used with slight wording differences, but all with identical introductory explanations. These included price, length, and weight information and were manageable without special prior knowledge. After conducting the experiment and analyzing the data, Janiszewski and Uy (2008) reported in the journal *Psychological Science* that higher precision led to estimates closer to the anchor.

In light of the replication crisis in psychology, findings published in *Psychological Science* have been repeatedly criticized: Many experiments could not be replicated in other labs with the same results, even when replication was faithful. The Janiszewski and Uy (2008) experiment was replicated by Chandler (2015)[2]. For this project, we will use Chandler's data, whose design differed only slightly from the original. Chandler (2015) used the same questionnaires as Janiszewski and Uy (2008), which can be found on Moodle as `Janizewski_Materials.doc`.

[1] Janiszewski, C., D. Uy. 2008. Anchor precision influences the amount of adjustment. *Psychological Science*, 19, 121–127.
[2] `https://osf.io/aaudl/`

## Experiment and Data

The dataset `Chandler.csv` contains the following variables:

*DROP* Was the person excluded from the analysis? (0 = No, 1 = Yes)

*Participant* Participant ID

*Age* Age in years

*Gender* with values `m` (= male), `f` (= female), and `x` (undocumented value; unclear if it stands for a missing response or one that is neither clearly `m` nor `f`)

*Year* Academic standing (`frosh` = Freshman, `soph` = Sophomore, `jr` = Junior, `sr` = Senior)

*Anchortype* Precision of the anchor (0 = low (round number), 1 = high (more decimal places))

*magnitude* Motivation, i.e., extent of the requested underestimation (1 = estimate below the anchor (stronger motivation to underestimate), 0 = estimate just slightly below the anchor)

*Condition* Index of the combination of Anchortype and Magnitude. This variable does not directly correspond to the questionnaire order in `Janizewski_Materials.doc` on Moodle, i.e., **Condition does not match the order of the questionnaires**.

This is followed by participant estimates for nine texts, with variable names derived from the text content:

*`pen`* How many km does the pen write?

*`Proteindrink`* Grams of protein in the drink

*`lebron`* Shooting accuracy of LeBron James

*`slidy`* Price of the toy Slidy

*`Cheese`* Price of QuickMelt Cheese

*`Figurine`* Price of a figurine at a flea market

*`TV`* Price of a 50-inch plasma TV

*`beachhouse`* Price of a beach house

*`number`* Value of a number in a computer

The variable `Notes` contains remarks by the experimenters about participant behavior during the study.

## Assignment

First, load the data and familiarize yourself with the variables. Then proceed as follows:

1. Discuss in your small groups how the experiment was conducted and characterize the experimental design.
2. The main question is whether the precision of the given anchor influences the estimation behavior, and whether this effect depends on the level of motivation. The effect of motivation may also be examined, but is of secondary interest. Formulate the hypothesis or hypotheses precisely.
3. Each participant provided nine estimates, often on very different scales or magnitudes. How can you make these estimates comparable? How can you aggregate them? Develop an approach that results in exactly one number per person, corresponding to the average difference from the anchor across all nine estimates.
4. Research a suitable statistical method and its assumptions for testing the null hypothesis/hypotheses.
5. How will you check the assumptions of the chosen test method?
6. With many hypothesis tests on the same dataset, there's a risk of inflating Type I error. Are there implications here?
7. Report your results appropriately. Graphical methods or effect sizes may be helpful.
8. Compare your results with those of Janiszewski and Uy (2008). Can we consider this a successful replication?
9. What practical implications or applications does the precision effect have? Is it practically relevant?

---

**Submit the report electronically along with the code (including all necessary files) via Moodle by June 1, 2025, 8:00 PM. A printed version is not required.**