# The Left Digit Effect in a Complex Judgment Task: Evaluating Hypothetical College Applicants

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## Introduction

**Left Digit Effect:** A numerical bias in which numbers with nearly identical magnitudes but different left digits are estimated to be significantly different from each other, while numbers with an identical difference in magnitude but same left digit are not.[1]

*e.g., 701 is estimated as significantly larger than 699*
*but 651 is estimated as about the same as 649*

The left digit effect was first studied in pricing: pens priced at $2.99 were judged to be less costly than pens priced just one cent higher, while no such difference was found with pens priced at $3.59 vs. $3.60.[2] More recently, the effect has been observed in judgment domains ranging from car odometer readings[3] to doctors' treatment decisions.[4]

The left digit effect has also recently been found in a widely used numerical cognition task: number line estimation. Numbers just above a hundreds boundary are placed significantly farther to the right on a number line than numbers just below the same boundary.[1] There is large individual level variation in the magnitude of the left digit effect.

**Research Questions:**
**(1)** Does the left digit effect extend to a more complex judgment task?
**(2)** Are individual differences in magnitude correlated across tasks?

## Experiment 1 and 2 Tasks

### College Admissions Task

Participants were asked to rate 20 hypothetical college applicant portfolios as if they were an admissions officer. Portfolios, shown one at a time, varied on five dimensions.

In Experiment 1, trials were presented in a forward or reverse version of a single random order. To test for a left digit effect, four critical portfolios were created by manipulating SAT-verbal scores across hundreds versus non-hundreds boundaries as shown below:

| Low Boundary | High Boundary | Low Non-Boundary | High Non-Boundary |
|---|---|---|---|
| Candidate: DP | Candidate: LD | Candidate: DH | Candidate: SW |
| GPA: 3.5 | GPA: 3.5 | GPA: 3.6 | GPA: 3.6 |
| LETTERS: 3 | LETTERS: 3 | LETTERS: 3 | LETTERS: 3 |
| ESSAY: 3 | ESSAY: 3 | ESSAY: 3 | ESSAY: 3 |
| SAT-V: 599 | SAT-V: 601 | SAT-V: 621 | SAT-V: 623 |
| SAT-M: 622 | SAT-M: 622 | SAT-M: 589 | SAT-M: 589 |

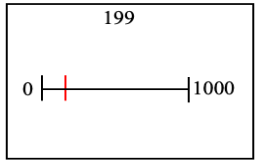
Participants responded by clicking on a line and moving the arrow to desired location.


Arrow placement was later converted to a number between 0 and 100.

In Experiment 2, the task was the same except we counterbalanced the four critical trials (with other trials in a constant order) and we also manipulated SAT-math scores, in addition to the SAT-verbal scores, to further enhance any left digit effect.

### Number Line Estimation Task

The task is to click where the target number goes on the line (the red mark appears where one clicks). In both Experiment 1 and 2, participants completed 120 trials of the task. To test for a left digit effect, eight pairs of target numbers were included, one pair surrounding each hundreds boundary (e.g., 299, 301).




*(Schematic not drawn to scale.)*

## Measures and Predictions

### College Admissions Task

- For each participant we calculated a **judgment difference score** =

***(rating of high boundary portfolio – rating of low boundary portfolio) – (rating of high non-boundary portfolio – rating of low non-boundary portfolio)***

Judgment difference scores > 0 indicate a left digit effect

### Number Line Estimation Task

- For each participant we calculated an **average hundreds difference score** for target values around a hundreds boundary =

***average (placement for larger numeral – placement for smaller numeral)***

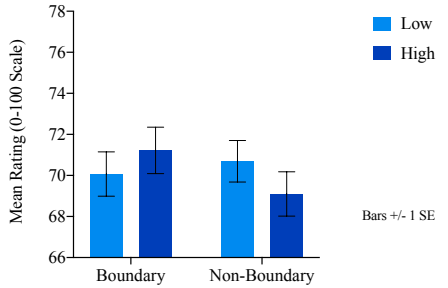
Hundreds difference scores > 0 indicate a left digit effect

## Experiment 1 Results

**Participants:** A total of 134 undergraduates completed Experiment 1.

### College Admissions Task

- **A small left digit effect was found.** Judgment difference scores had a mean of 2.58 (*SD* = 13.99) which is significantly different from 0 ($t(133) = 2.14$, $SE = 1.21$, $p = .034$, $d = 0.18$), with 55% of participants having a score greater than 0. The mean ratings by trial type are shown below.




### Number Line Estimation Task

- **A large left digit effect was found.** Hundreds difference scores had a mean of 25.89 (*SD* = 21.53) which is significantly different from 0 ($t(133) = 13.92$, $SE = 1.86$, $p < .001$, $d = 1.20$), with 89% of participants having a score greater than 0.

### Relationship Between Tasks

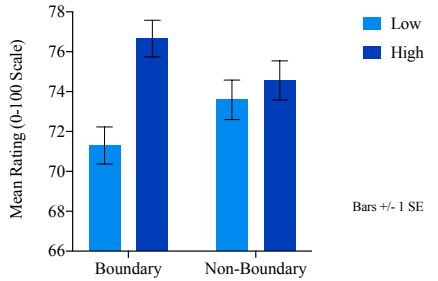
- **Individual differences were not correlated across tasks.** Judgment difference scores were not reliably correlated with hundreds difference scores ($r(132) = 0.10$, $p = .104$).

## Experiment 2 Results

**Participants:** A total of 157 undergraduates completed Experiment 2.

### College Admissions Task

- **A moderate left digit effect was found.** Judgment difference scores had a mean of 4.18 (*SD* = 13.47) which is significantly different from 0 ($t(156) = 3.89$, $SE = 1.08$, $p < .001$, $d = 0.31$), with 60% of participants having a score greater than 0. The mean ratings by trial type are shown below.




### Number Line Estimation Task

- **A large left digit effect was found**. Hundreds difference scores had a mean of 19.98 (*SD* = 19.51 ) which is significantly different from 0 ($t(156) = 12.83$, $SE = 1.56$, $p < .001$, $d = 1.01$), with 86% of participants having scores greater than 0.

### Relationship Between Tasks

- **Individual differences were not correlated across tasks.** Judgment difference scores were not reliably correlated with hundreds difference scores ($r(155) = -0.11$, $p = .162$).

## Conclusions and Future Directions

We found that the left digit effect does extend to the more complex judgment task of college applicant evaluation, extending the contexts in which the effect has been found, consistent with past evidence that the effect is not specific to domain or to number format.

While there were large individual differences in the left digit effect in both tasks, individual-level variation was not correlated across tasks, suggesting that there may not be one common source of bias, and that number line estimation tasks cannot be used to predict one's judgment bias.

### Future Questions:

- Is size of the left digit effect (in judgment) correlated on more closely related judgment tasks?
- If not number line estimation skills, what are the correlates of the size of this left digit effect?

## References and Acknowledgments

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We thank Reasoning and Decision Making Lab researchers at Wesleyan University. This work was supported by NSF DRL-1920445 and benefited from NSF DRL-1561214 to HB and ALP.