

Graphical Perception of Stacked Area Charts

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Introduction

Stacked area charts are a common method for visualizing multiple time series, but they are frequently criticized as being perceptually ineffective or misleading because the top segments are distorted by the ones below.

Research on graphical perception, "the visual decoding of information encoded on graphs" (Cleveland & McGill, 1984), tests viewers' ability to read data out of visualizations. Thudt et al. (2016) found that viewers' performance on graphical perception tasks was poorer for stacked area charts than other types of stacked charts. I conducted an experiment of additional perception tasks to examine how accurately viewers can read the values in these charts, and whether chart shape affects perception.

How accurately do viewers read data out of stacked area charts?

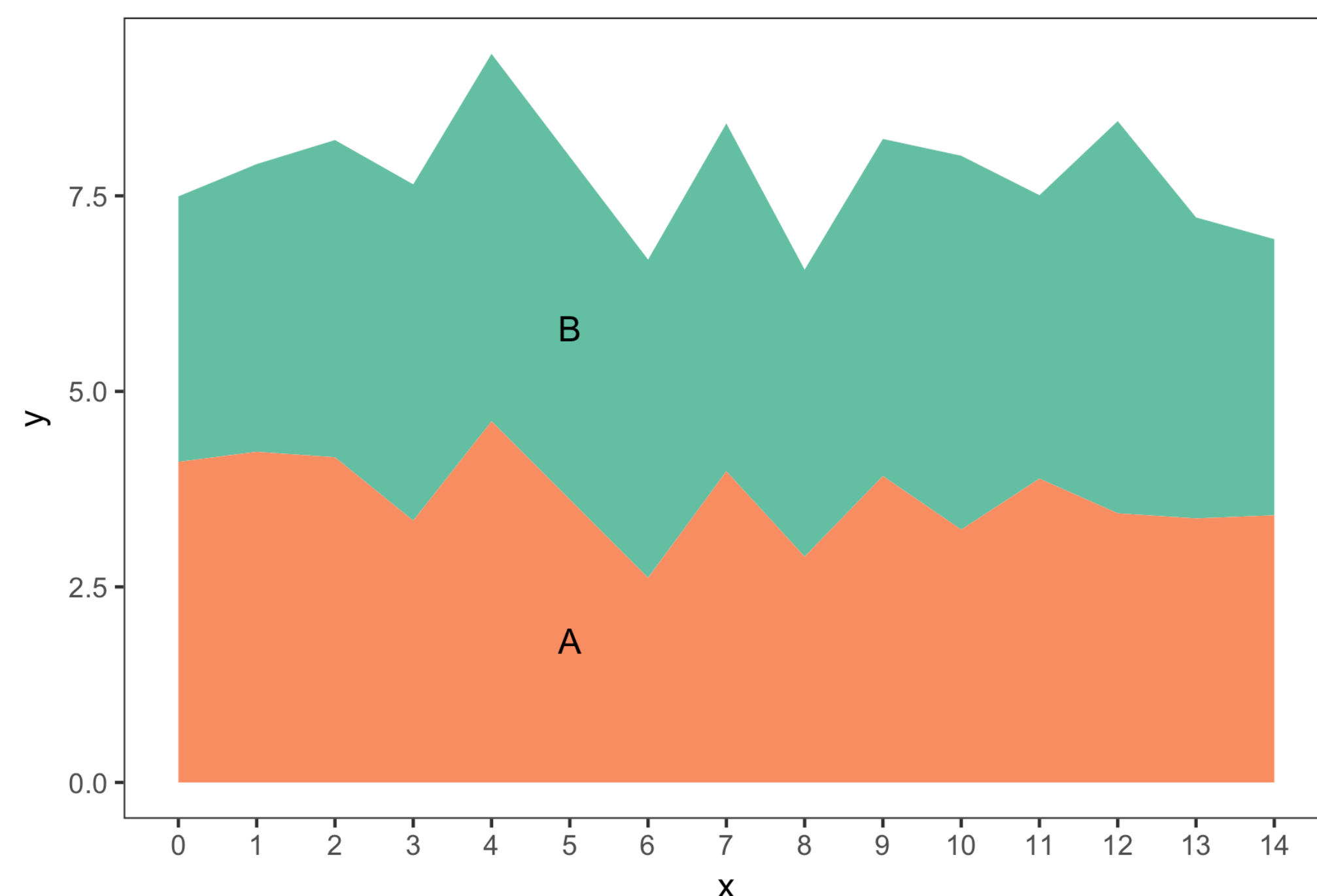


Figure 1: A sample stimulus used in the experiment

Acknowledgments

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Methods

I tested viewers' perceptions of stacked area charts using methods based on those of Cleveland & McGill (1984) and Heer & Bostock (2010). I created stacked area charts of different shapes with specific ratios between the segment sizes. I also included stacked bar charts for comparison with prior work. 64 people participated in the study. Participants saw images of the charts (see Fig. 1) and were asked:

- Which marked segment was smaller
- What percent the smaller made up of the larger
- The value of the smaller segment at the point where the chart was marked

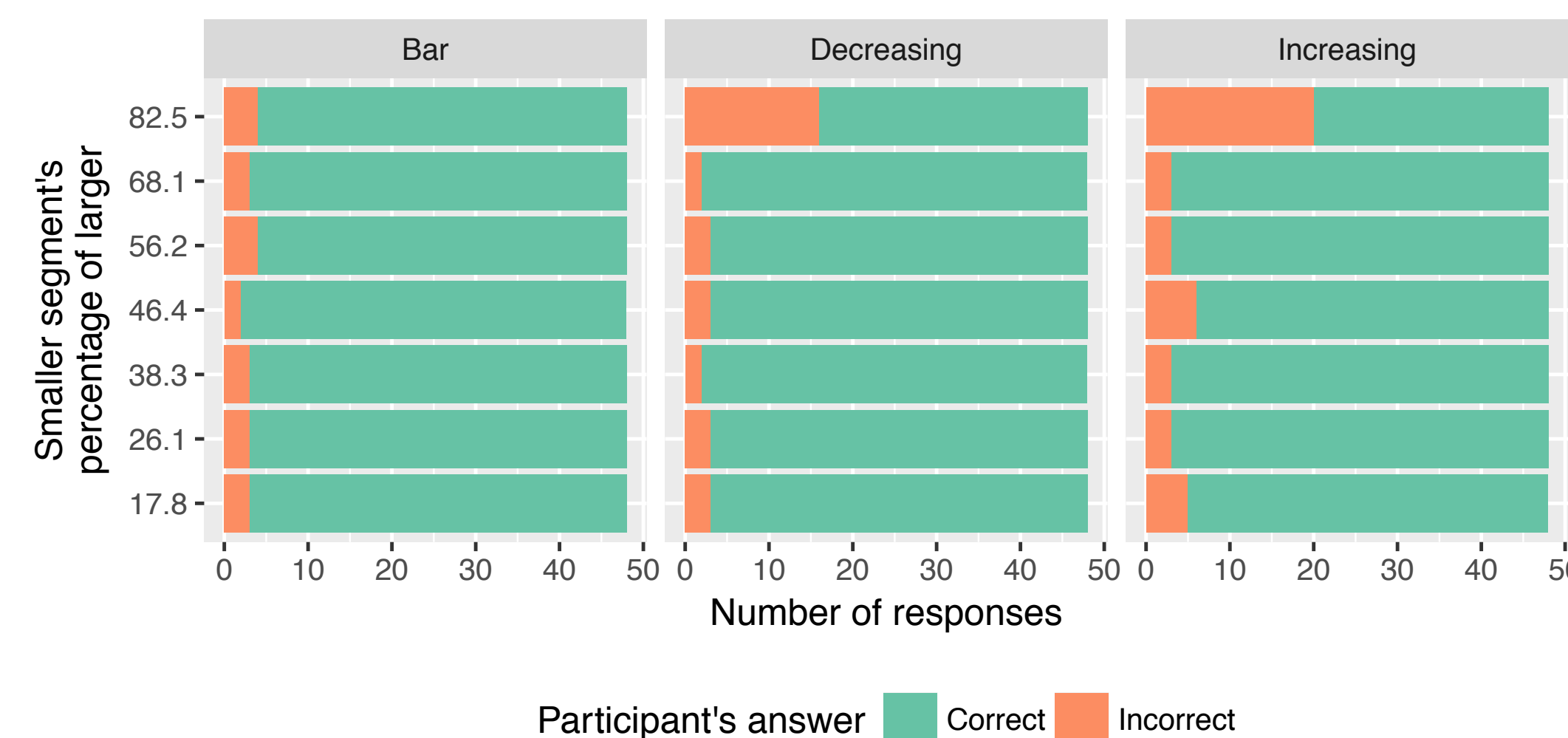


Figure 2: Number of participants who correctly identified the smaller segment in the stimuli. In total there were 911 correct answers and 97 incorrect answers.

Results

Most participants correctly identified the smaller segment in each chart. There were more errors at the highest proportion, when the smaller segment was 82.5% of the larger as in Fig. 1.

Participants' judgments of the relative sizes of the marked segments were less accurate when segments were closer in size, and were somewhat higher overall than in previous work on other chart types.

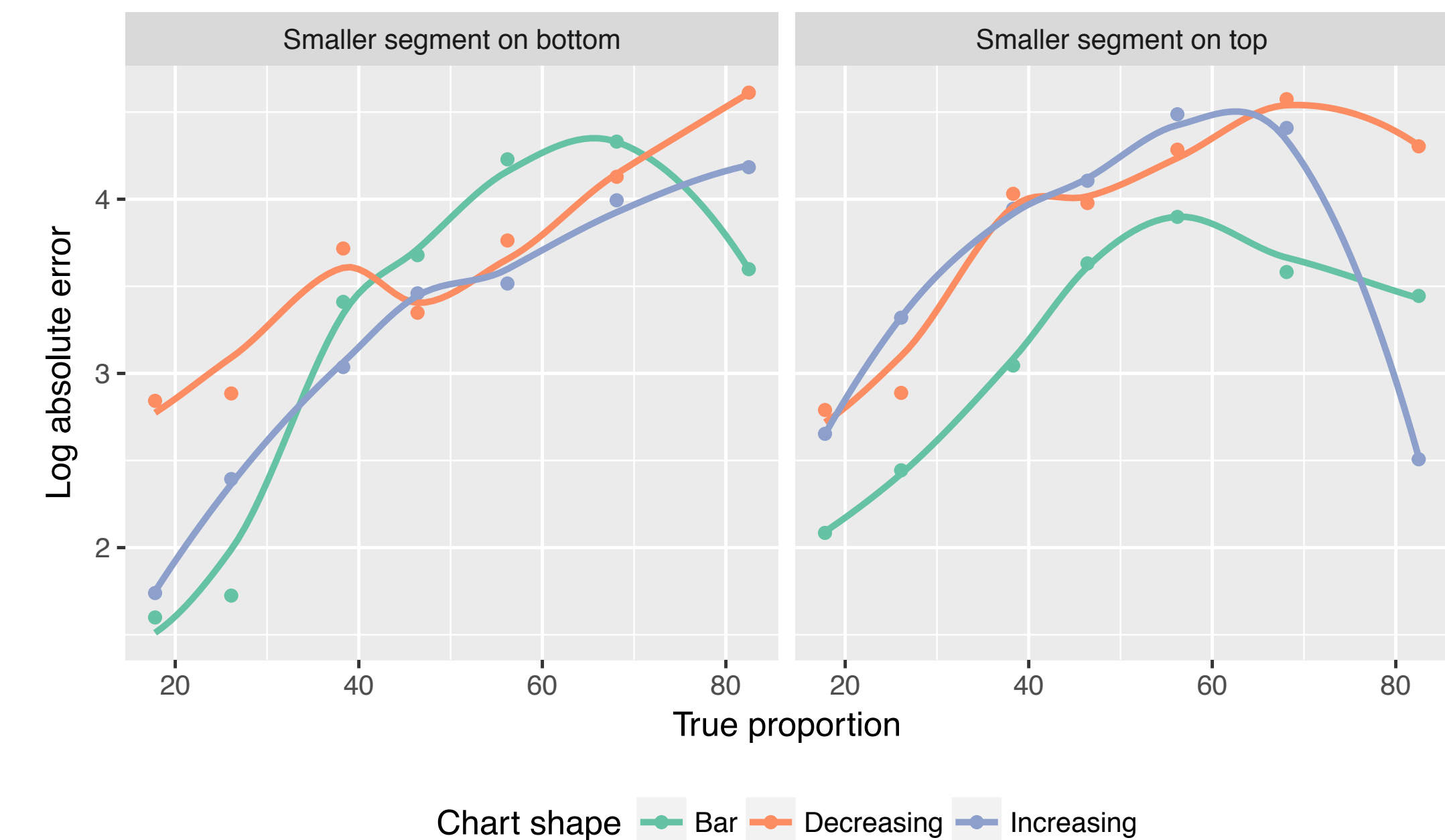


Figure 3: Midmeans of log absolute error in viewers' guesses of what proportion the smaller segment made up of the larger.

Conclusions & Next Steps

Viewers were less able to identify the smaller of two marked segments in stacked area charts than in stacked bar charts, but their judgments of the relative sizes of the segments was not conclusively different between stacked bar and stacked area charts.

This experiment was a pilot that I plan to refine and run again with some minor modifications. I also plan to examine the effects of visual illusions such as the line width illusion on viewers' estimates of segment size.

References

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