THE EFFECT OF BENCHMARKS ON STRATEGY USE IN FRACTION COMPARISON PROBLEMS

Andreas Obersteiner[1,2], Vijay Marupudi[1], & Martha W. Alibali[1]

[1]University of Wisconsin-Madison, U.S. [2]Freiburg University of Education, Germany

When people compare the numerical values of two fractions, the fractions' natural number components may interfere with reasoning about magnitudes, yielding a "natural number bias" (Ni & Zhou, 2005). However, not all studies reveal the bias, and some studies have revealed a reverse bias (e.g., DeWolf & Vosniadou, 2015). In this study, we investigated whether the strategies people use to compare fractions depend on features of the problems. We were particularly interested in the role of benchmarks (reference numbers, e.g., ½), which people may use to compare fractions. Moreover, we investigated whether strategy use affects the occurrence and strength of a natural number bias.

Adults solved complex fraction comparison problems and reported their strategies on a trial-by-trial basis. Half of the pairs were congruent (i.e., the larger fraction had the larger components) and half were incongruent (i.e., the larger fraction had the smaller components). The congruent and incongruent sets were balanced in terms of the fractions' magnitudes relative to common "benchmarks" (i.e., reference points, specifically, ¼, ½, or ¾). In "straddling" problems, one fraction was smaller and the other larger than one of these benchmarks. In "in-between" problems, both fractions were in between two adjacent benchmarks. In a special subcategory of "in-between" problems, both fractions were either smaller than ¼ or larger than ¾; in these problems, one fraction was close to 0 or 1, which may be especially salient benchmarks. Some participants also received a tip that benchmarks could be useful.

Overall, we found a reverse "smaller components—larger fraction" bias. Participants varied in their strategy use across problem types, indicating that they used strategies adaptively. On problems in which one fraction was close to 0 or 1, they used generally incorrect, component-based strategies more often than on other problems. For the other two problem types, participants used component-based strategies less often, and used benchmark strategies somewhat more often. The tip about using benchmarks had little effect. Participants seemed to adapt their strategies to the affordances of different problems, including the fractions' relative positions to benchmarks. Thus, patterns of strategy use may at least partially explain the occurrence and the direction of the natural number bias in fraction comparison.

References

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