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The exponential growth bias in graphs: how to avoid contextual pitfalls

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Abstract

Humans systematically underestimate exponential growth, which directly impacts their real-world behavior. Recent research yielded conflicting results as to the origins of this cognitive bias. In this study, we present an experiment with a short educational intervention, in which we further examine factors modulating the exponential bias in graphs. We test the hypothesis that the use of logarithmic vs. linear scales can induce misperceptions in a specific context. Moreover, we explore the effect of mathematical education by testing two groups of participants (humanities vs. formal sciences). The results confirm that when used in an inadequate context, these scales can strongly impact the interpretation of visualizations. While the log scale leads to errors in graph description, the linear scale misleads people in prediction tasks. Our educational intervention significantly reduced these difficulties, although the learning effect was greater for mathematically-skilled participants. These findings are discussed in light of a dual-process model.