MODELING PERFORMANCE IN VISUAL RATIO COMPARISON

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Research in numerical cognition investigates the mental mechanisms used by people to work with numbers and grasp mathematical concepts. A core concept in numerical cognition is the *approximate number system*, believed to support people's ability to construct mental representations of quantities and predict mathematics achievement (Halberda et al., 2008). Some authors claim that this ability extends beyond natural numbers to include ratios of numbers, and that the ability to visually discriminate ratios of quantities predicts performance with symbolic numbers (Matthews et al., 2016).

A widely debated issue regards the nature of these mental mechanisms. Many studies have shown that performance in comparing visually presented quantities is better modeled by using the ratio distance between numbers ($dist(m,n) = |\log(m/n)|$) instead of their linear distance ($dist(m,n) = |m-n|$). I will present data from young adults (N=24) performing a visual ratio comparison task. Participants viewed pairs of sets of dots for 1000 ms and decided which pair had a higher ratio of a given color (Fig. 1). Results showed that ratio distances provide a better description of participants' performance (Fig. 1), implying that this model is better not only for visual comparison of quantities but also of ratios of quantities. This indicates that the mental mechanisms underlying ratio comparison work similarly to those of number comparison. I will discuss the implications of these results for the research on intuitive work with ratios.

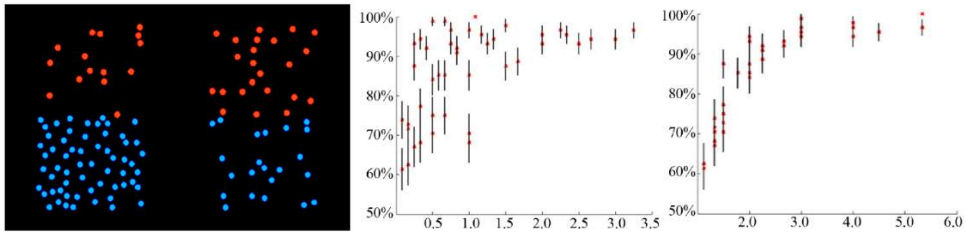

Figure 1: Example stimulus (left panel). Participants' accuracy depicted as a function of the linear distance between ratios (middle panel) or their ratio distance (right panel)

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References

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