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Proceedings of the Annual Meeting of the Cognitive Science Society

Title

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Permalink

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Journal

Proceedings of the Annual Meeting of the Cognitive Science Society, 40(0)

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Publication Date

2018

Cognitive Processes in Numerosity Comparison: Theory and Data

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Abstract

In numerosity comparison, performance is faster, more accurate, and less noisy with the ratio of compared numbers. Whereas the ratio-dependency has been intensively studied in relation to internal noise, processes of numerosity comparison that may increase internal noise have not been fully understood. In this paper, we propose a process theory that accounts for non-numerical, visuo-spatial processes in numerosity comparison. Consistent with the theory, we found that as required processes decreased, performance improved significantly, to the extent that there were no differences between non-symbolic and symbolic number comparison in reaction time, accuracy, and internal noise. The findings suggest that comparing numerosities requires multiple processes homogenizing ancillary stimulus dimensions and that the homogenization processes are the major source of fuzziness in approximate number comparison.