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The Development of Space-Time and Space-Number Associations: The Role of Non-Symbolic vs. Symbolic Representations

Authors : Letizia Maria Drammis, Maria Antonella Brandimonte

Abstract : The idea that people use space representations to think about time and number received support from several lines of research. However, how these representations develop in children and then shape space-time and space-number mappings is still a debated issue. In the present study, 40 children (20 pre-schoolers and 20 elementary-school children) performed 4 main tasks, which required the use of more concrete (non-symbolic) or more abstract (symbolic) space-time and space-number associations. In the non-symbolic conditions, children were required to order pictures of everyday-life events occurring in a specific temporal order (Temporal sequences) and of quantities varying in numerosity (Numerical sequences). In the symbolic conditions, they were asked to perform the typical time-to-position and number-to-position tasks by mapping time-related words and numbers onto lines. Results showed that children performed reliably better in the non-symbolic Time conditions than the symbolic Time conditions, independently of age, whereas only pre-schoolers performed worse in the Number-to-position task (symbolic) as compared to the Numerical sequence (non-symbolic) task. In addition, only older children mapped time-related words onto space following the typical left-right orientation, pre-schoolers' performance being somewhat mixed. In contrast, mapping numbers onto space showed a clear left-right orientation, independently of age. Overall, these results indicate a cross-domain difference in the way younger and older children process time and number, with time-related tasks being more difficult than number-related tasks only when space-time tasks require symbolic representations.

Keywords : space-time associations, space-number associations, orientation, children
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