

Development of Visual Working Memory Precision: A Cross-Sectional Study of Simultaneously Delayed Responses Paradigm

Authors : Yao Fu, Xingli Zhang, Jiannong Shi

Abstract : Visual working memory (VWM) capacity is the ability to maintain and manipulate short-term information which is not currently available. It is well known for its significance to form the basis of numerous cognitive abilities and its limitation in holding information. VWM span, the most popular measurable indicator, is found to reach the adult level (3-4 items) around 12-13 years' old, while less is known about the precision development of the VWM capacity. By using simultaneously delayed responses paradigm, the present study investigates the development of VWM precision among 6-18-year-old children and young adults, besides its possible relationships with fluid intelligence and span. Results showed that precision and span both increased with age, and precision reached the maximum in 16-17 age-range. Moreover, when remembering 3 simultaneously presented items, the probability of remembering target item correlated with fluid intelligence and the probability of wrap errors (misbinding target and non-target items) correlated with age. When remembering more items, children had worse performance than adults due to their wrap errors. Compared to span, VWM precision was effective predictor of intelligence even after controlling for age. These results suggest that unlike VWM span, precision developed in a slow, yet longer fashion. Moreover, decreasing probability of wrap errors might be the main reason for the development of precision. Last, precision correlated more closely with intelligence than span in childhood and adolescence, which might be caused by the probability of remembering target item.

Keywords : fluid intelligence, precision, visual working memory, wrap errors

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