

Investigating the Neurocognitive Changes to Structured Sequence Processing Following Computerized Training

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Introduction

Structured sequence processing (SSP) refers to the neurocognitive mechanisms used to learn sequential patterns in the environment. SSP is essential for knowledge and use of language (Conway, Bauernschmidt, Huang, & Pisoni, 2010; Conway, Pisoni, Anaya, Karpicke, & Henning, 2011). Disturbances to SSP may even play a role in the development of certain language and communication disorders (Conway et al., 2011). Given the importance of SSP for language functions, it may be beneficial to develop interventions aimed at enhancing SSP. Recent research suggests that it may be possible to improve SSP with computerized cognitive training techniques (Smith, Conway, Bauernschmidt, & Pisoni, 2015). However, the neural mechanisms underlying the effects of such training are not well understood. Therefore, the purpose of this study was to further explore the cognitive and neural consequences of SSP training.

Method

Typically-developing adults (N=24) were quasi-randomly assigned to computerized SSP training, active control, or passive control. SSP training involved a visual-spatial sequence reproduction task with underlying statistical patterns in the sequences. Following 10 days of training or control, participants were reassessed on non-trained baseline measures. Event-related potentials (ERPs) were used to explore neural changes to SSP resulting from training. Changes to behavioral performance following training were also examined.

Results

ERP findings indicate that the training modulated the P3a component in frontal regions. In addition, behavioral results suggest an improvement to reproduction accuracy of the visual sequences following training [$t(1,10)=4.87, p=.001$].

Conclusions/Discussion

These results demonstrate the potential feasibility of utilizing computerized training to improve SSP. The effects of training may possibly be mediated by changes to attention or working memory. Overall, these findings shed light on the potential mechanisms involved in training-related changes to SSP, which may have implications for improving language processing in typical and atypical development

KEYWORDS:

1. Structured Sequence Processing (SSP)
2. Language
3. Computerized Training
4. Event Related Potential (ERP)
5. P3a