Eye movements and mental attentional capacity in children and adults

Valentina Bachurina(1); Marie Arsalidou PhD (2)

1 – National Research University Higher School of Economics, Moscow, Russia

2 – National Research University Higher School of Economics, Moscow, Russia; York University, Toronto, Canada

Introduction

- Eye-tracking is a non-invasive method that has been repeatedly used to study attention and related cognitive processes.
- While eye-tracking is not a direct measure of brain activity, it has been shown to reveal information about mental processes¹.
- Mental attentional capacity (MAC) corresponds to the amount of information an individual can maintain and manipulate in mind²
- MAC is considered the central maturational component of working memory³ and it is closely related to other aspects of cognitive competence and intelligence.

The purpose of this study is to investigate the relation between eye-tracking indices (e.g., number and duration of fixations) and MAC.

Method

- EyeLinkPortableDuo (SR Research_ portable eye-tracker)
- 33 adults (M=22.8±4.1, 17 male) and 15 children (age 8-9 years, 4 male)
- Colour Matching Task (CMT) – visual-spatial measure of MAC (Figure 1)
- Control task – anti/pro-saccade task (Figure 2)

Figure 1. Example of CMT stimuli.

Figure 2. Example of pro-saccade and anti-saccade stimuli.

Results

- Two-way ANOVA revealed significant effect ($p < 0.005$) of both MA load and interference condition on reaction times and accuracy in the Colour matching task
- Two-way ANOVA revealed a significant effect of difficulty for number of fixations for both age groups (adults: $F = 50.05$, $p = 0.000286$, $\eta^2 = 0.96744564$ and children $F = 5$, $p = 6.39e-05$, $\eta^2 = 0.1409805$).
- ANOVA conducted to test for effect of age group found a significant effect ($p = 0.00412$)
- ANOVA revealed significant difference between age groups for the anti/pro-saccade

Figure 3. Fixations per difficulty level and age group

Figure 4. Accuracy per difficulty level and age group

Discussion

Number of fixations increase with difficulty as expected.

For children the number of fixations increased sharply after the first level of difficulty and then remained more stable.

According to predictions an effect of interference is found in terms of reaction time, and not according to prediction effect of interference was not found in terms of eye-movements indices.

References :

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