Dyslexia prevention by action video game training: behavioural and neurophysiological evidence

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Abstract

For children affected by developmental dyslexia learning to read is extremely difficult. Pre-reading visual attention predicts future reading acquisition skills. Action video game (AVG) training increases attentional functioning and induces learning that transfers well beyond the task domain, such as reading. We investigated the effects of AVG training on predictors of future reading acquisition (i.e., visuo-spatial attention, auditory-phonological processing and rapid naming skills) and on the dense-array EEG resting-state in pre-reading children at risk for dyslexia. Three matched groups of pre-readers at risk for dyslexia were tested before and after they played with AVG, non-AVG (for 20 hrs) or no-treatment (Exp. 1). We found that only playing AVG improved children's visuo-spatial attention processing. Phonemes discrimination was also increased only after AVG training. We confirmed this effect of AVG training on phonological processing in a replication study with another independent sample (Exp. 2). Two new samples of pre-schoolers at risk for dyslexia were selected (Exp. 3): half of them were trained with AVG while the other half had no training. We measured visuo-spatial attention and auditory-phonological skills. Eyes-closed resting-state EEG was also recorded in both groups. Results showed that only the AVG training improved visuo-spatial attention as well as auditory-phonological skills. A reduction of the upper alpha band (10-14 Hz) oscillatory activity in posterior areas was found only after the AVG training, showing a possible neural basis of the effect of attentional improvement on auditory-phonological processing. Our results showed, for the first time, that attention improvements can directly translate into better language abilities, providing a new, fast and fun prevention training for dyslexia.

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