

Retention of saccadic adaptation induced by reinforcement learning

Céline Paeye

Laboratoire Vision Action Cognition, Institut de Psychologie, Université de Paris,
71 avenue Edouard Vaillant, 92100 Boulogne-Billancourt, FRANCE

We have previously shown that saccadic amplitude can be adapted via reinforcement learning and not only via the conventional double-step paradigm (Madelain, Paeye & Wallman, 2011). To disentangle post-saccadic visual error (known to induce saccadic adaptation) from reinforcement, we extinguished the target during saccades and provided rewarding tones whenever saccades met specific amplitude criteria. Such auditory reinforcement induced changes in saccadic amplitude similar to the changes obtained using the double-step paradigm. We proposed that saccadic adaptation might involve a general learning mechanism in which saccades are reinforced by the clear vision of the target.

The goal of the present study is to examine the retention of reinforced adaptation. Saccadic amplitude was decreased (backward adaptation) or increased (forward adaptation) using our reinforcement paradigm. Five days after the last reinforcement session, the amount of backward adaptation ($n=4$) was still significant (-23.1%, SEM=9.4, retention rate: 81%) and forward adaptation ($n=4$) kept increasing (27.3%, SEM=11.5, retention rate: 145%). Preliminary data also showed retention 12 and 19 days after the last reinforcement session. Overall, the retention was stronger than in conventional adaptation.

These long-lasting effects of reinforced adaptation are consistent with previous findings indicating that the effects of conventional backward adaptation can still be observed two months later (Wang et al., 2012). This provides further argument for the involvement of a general learning mechanism in saccadic adaptation. Presumably, auditory consequences of saccades provided during reinforcement sessions increased context specificity, crucial for sensorimotor adaptation.