Vullings, C., & Madelain, L. (2015). Choice and saccadic latency in a concurrent random interval reinforcement program. Forum Annuel Du Groupement De Recherche Vision. Grenoble, France.

Conventional decision models view reaction time as a consequence of decision-making process and it is classically assumed that the voluntary decision that one can make is where to make a saccade: changes in latency distributions are viewed as an artifact arising from the experimental conditions. However, some studies showed that reaction time distributions may be affected by reinforcement contingencies (Madelain et al., 2007). Here, we probe the possibility of a voluntary control of saccadic latencies in a choice paradigm.

Three subjects (including the two authors) made saccades to a visual target stepping horizontally by 10 deg between two fixed locations. Subjects had to make a saccade between 80 and 300 ms after the target step, otherwise the trial was discarded. We defined two types of responses, i.e. short and long saccadic latencies, using the first and last quartiles of individual baseline latency distributions respectively. We then used concurrent random interval reinforcement programs in which short and long latencies were reinforced with different probabilities in two simultaneous components (ratios 1/1, 9/1, 1/9).

For two subjects, we observed a sharp modification in latency distributions, which became bimodal with a peak for short latencies and another for long ones, and a decrease in the proportion of intermediate latencies. These changes were less pronounced for the third subject. To investigate choice, we used the generalized matching equation (Baum, 1974) which states that the relative proportion of choices made to an option matches the relative proportion of income earned from that option. For two subjects, we found an almost perfect match between the relative proportion of choices and the obtained reinforcement. In addition, we found significantly higher saccade peak velocities for short than for long latency saccades (p < .001) and these increases are not predicted by the main sequence.

These results indicate that saccadic latencies may be allocated depending on the reinforcement contingencies in force, which support the idea of a voluntary control of saccade reaction time.