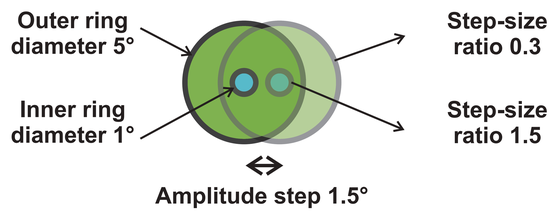
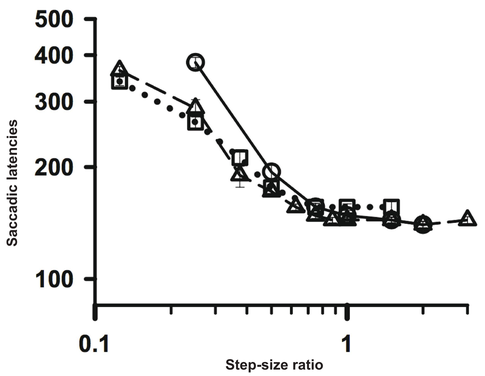
Effect of reinforcement on the size-latency phenomenon

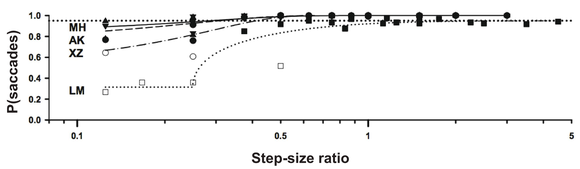
Cécile Vullings[1], Mark R. Harwood[2], & Laurent Madelain[1]
[1]Laboratoire SCALab, UMR CNRS 9193, Université de Lille, France
[2]University of East London, UK

INTRODUCTION

Saccadic latencies are known to depend on target eccentricity. Recently, it has been shown that latencies consistently change according to a step-size ratio (Madelain et al., 2005; Harwood et al., 2008; De Vries et al., 2016), an effect termed the size-latency phenomenon.



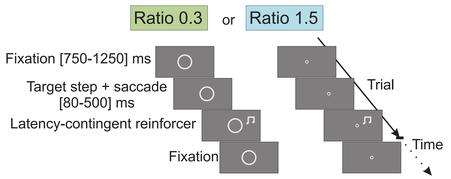




Hypothesis: latencies are function of an implicit cost-benefit relationship.

We probe this hypothesis by explicitly manipulating the benefit of specific latencies using a reinforcement procedure.

METHODS



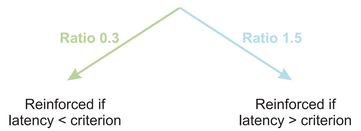
Step-size ratios

Ratio 0.3		Ratio 1.5	
Step (deg)	Size (deg)	Step (deg)	Size (deg)
1.2	4	1.5	1
1.5	5	2.5	1.67
2.1	7	6	4
2.5	8.33	10.5	7

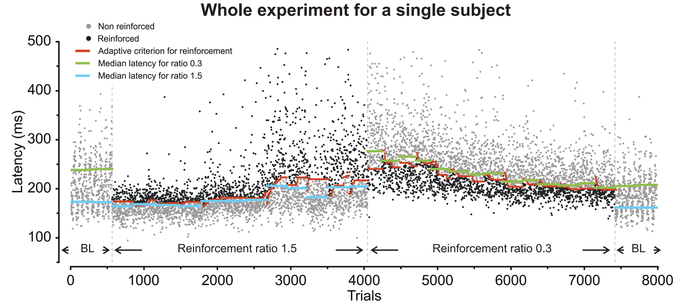
- 320 trials per session
- 40-trial blocks with one ratio during baseline
- 30 sessions per subject
- Reinforcer = 0.02€ signaled by a sound
- 2 counterbalanced blocked conditions

We used a adaptive reinforcement criterion

Criterion = the median latency computed over a 50-trial moving window for each ratio:

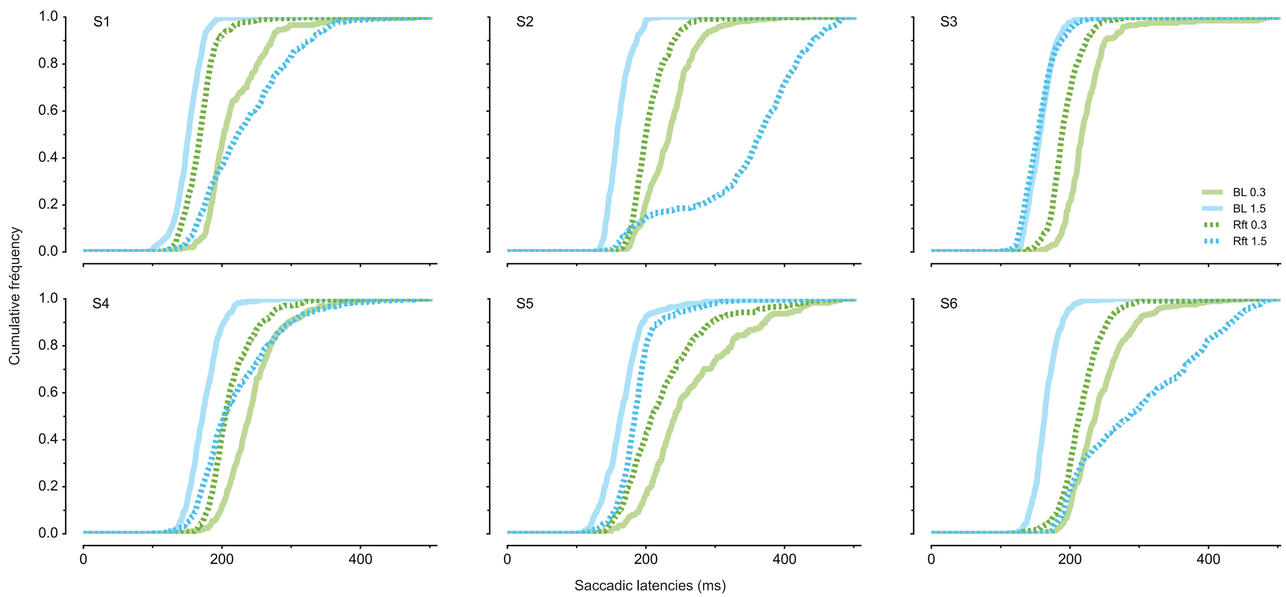


Whole experiment for a single subject

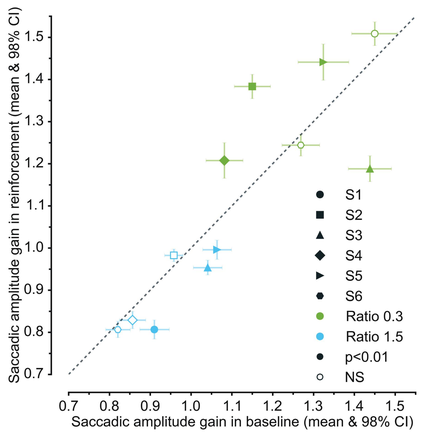


RESULTS

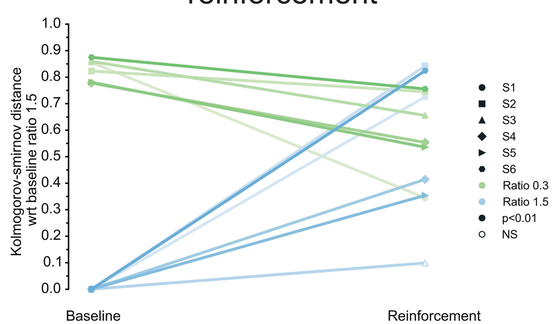
Manipulating the cost-benefit relationship changed the latency distributions



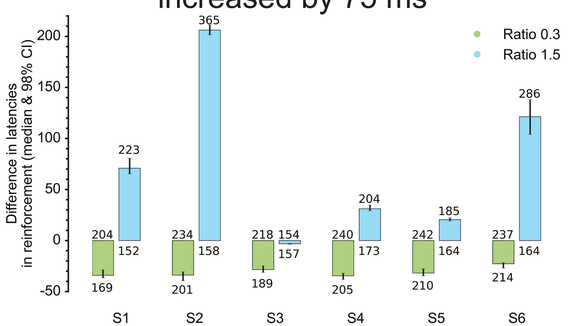
Changes in saccadic latencies are not explained by changes in saccadic amplitudes



KS distance changed as a function of reinforcement



Latencies decreased by 31 ms and increased by 75 ms



CONCLUSION

- Reinforcement contingencies considerably affect saccadic latency distributions.
- Reinforcement reduced the size-latency effect.
- The size-latency effect was still present.
- Our results support the idea of a cost-benefit evaluation for saccade triggering.

REFERENCES

Madelain et al. (2005). Spatial deployment of attention influences both saccadic and pursuit tracking. *Vision Research.*
Harwood et al. (2008). The spatial scale of attention strongly modulates saccade latencies. *Journal of Neurophysiology.*
De Vries et al. (2016). The saccadic size-latency phenomenon explored: Proximal target size is a determining factor in the saccade latency. *Vision Research.*

ANR grant ANR-13-APPR-008 (CV, LM), NSF grant NSF:1232654 (MH) and PhD grant from the French Ministry for Research (CV)