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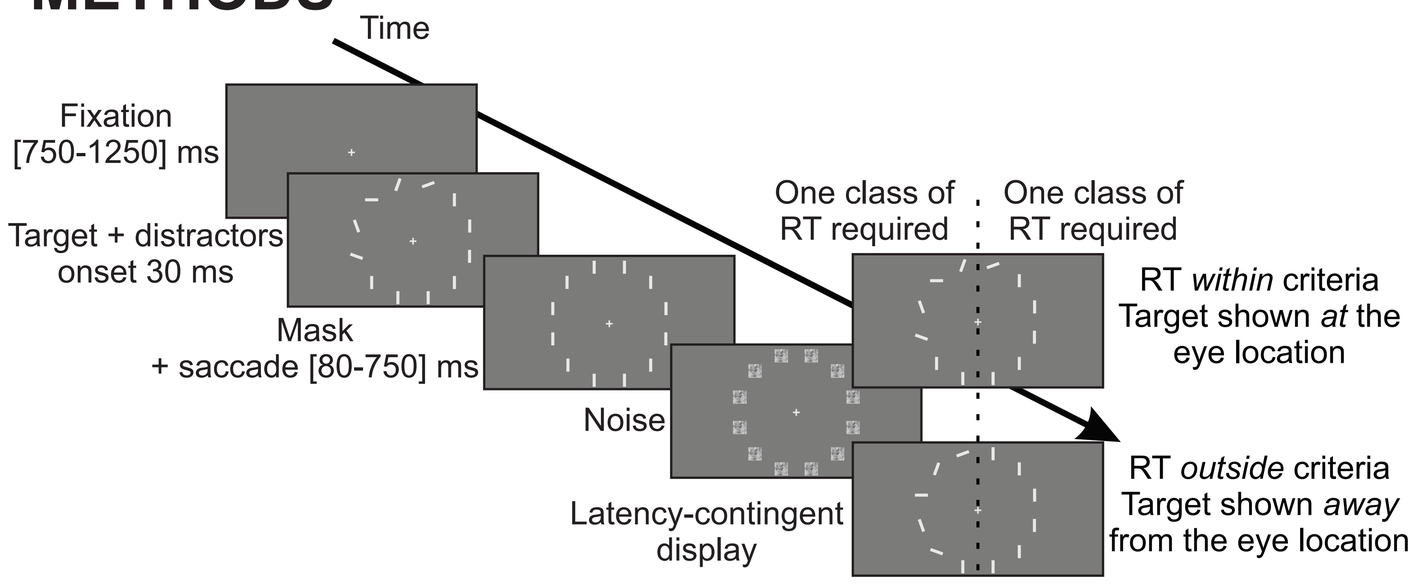
Contextual control of saccadic reaction times using a latency-contingent paradigm

INTRODUCTION

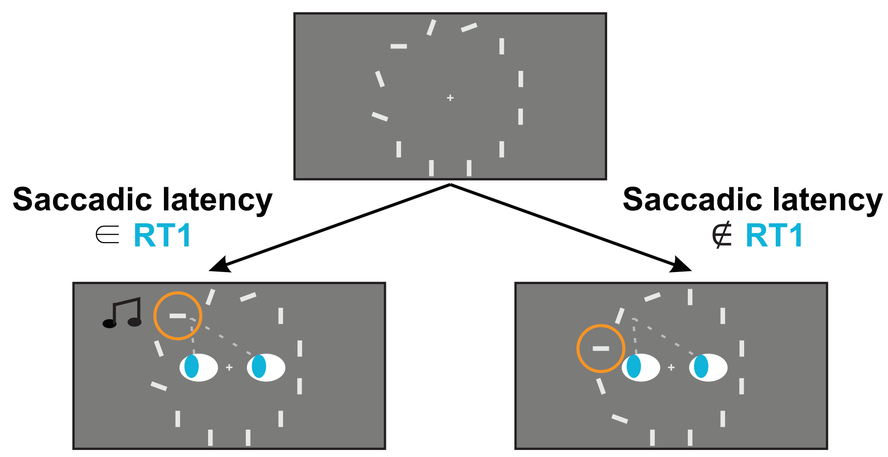
Saccades are conventionally regarded as being mostly concerned with the spatial position of objects. However, recent studies have shown that they are also affected by the temporal regularities in dynamic environments (e.g. Hoppe & Rothkopf, 2016; Vullings & Madelain, 2016).

Here, we probe whether contextual control of saccadic latencies in a search task can be established using reinforcement learning.

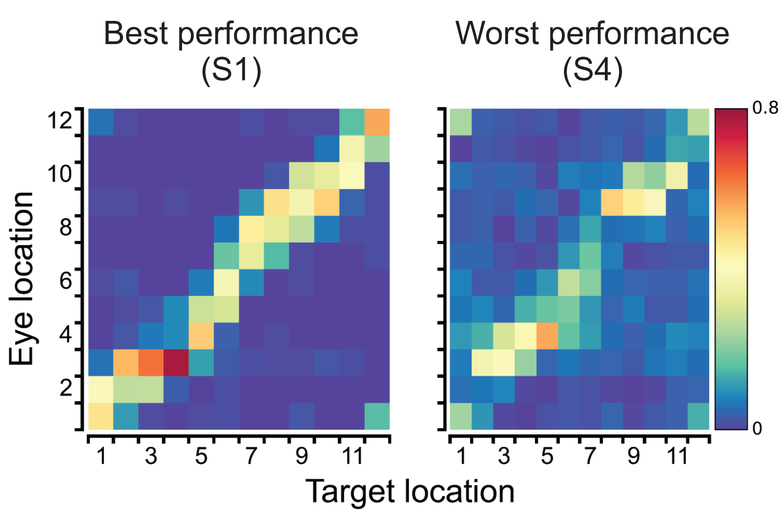
METHODS



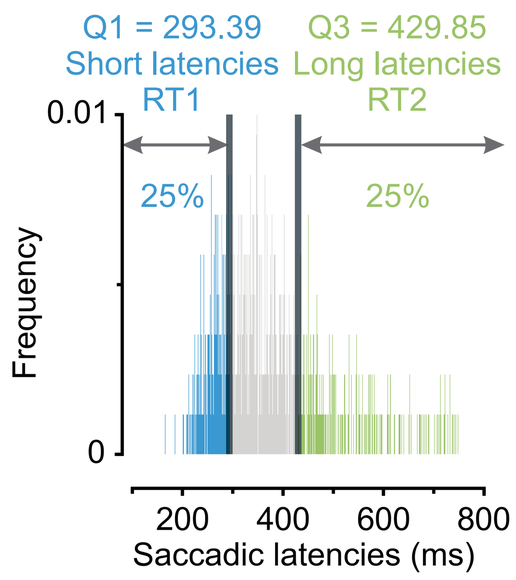
Instance of latency-contingent display for group 1



During baseline, the probability of landing on target was low (on average p = 0.3)



Using the individual baseline latency distributions, we defined short and long latencies



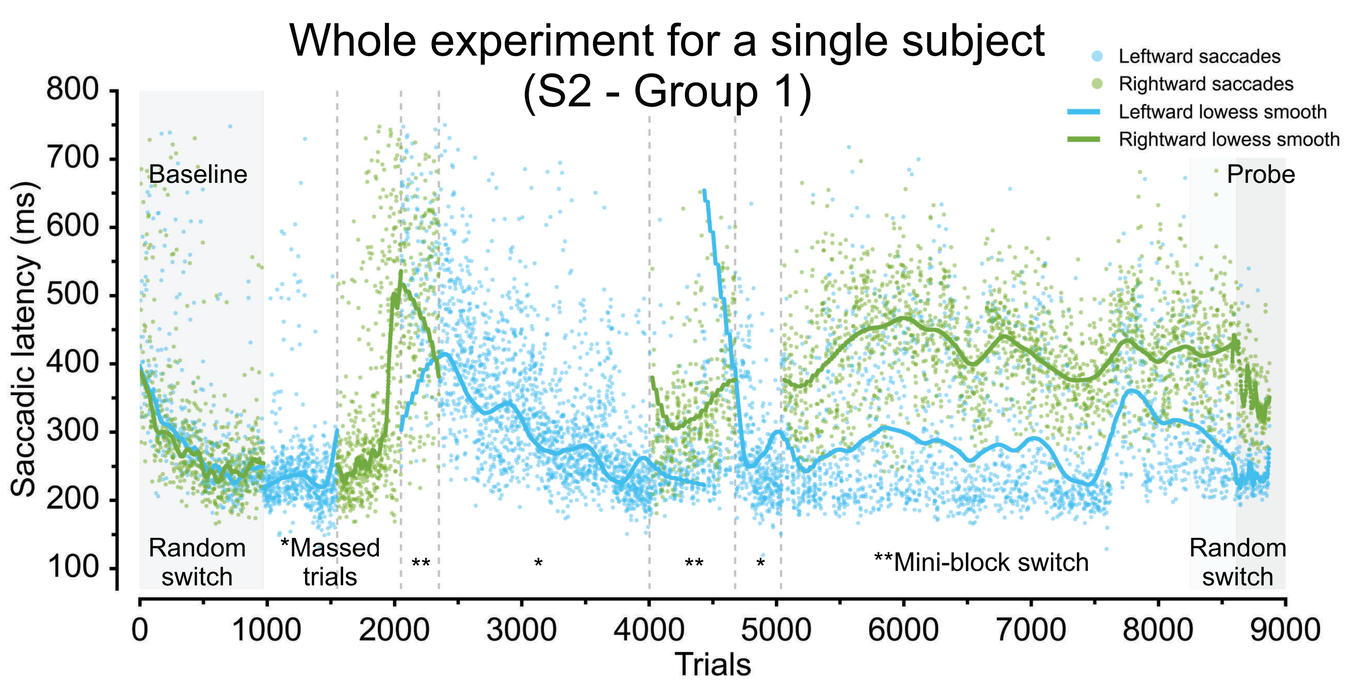
Latency-contingent display paradigm: finding the target was made contingent upon specific latencies

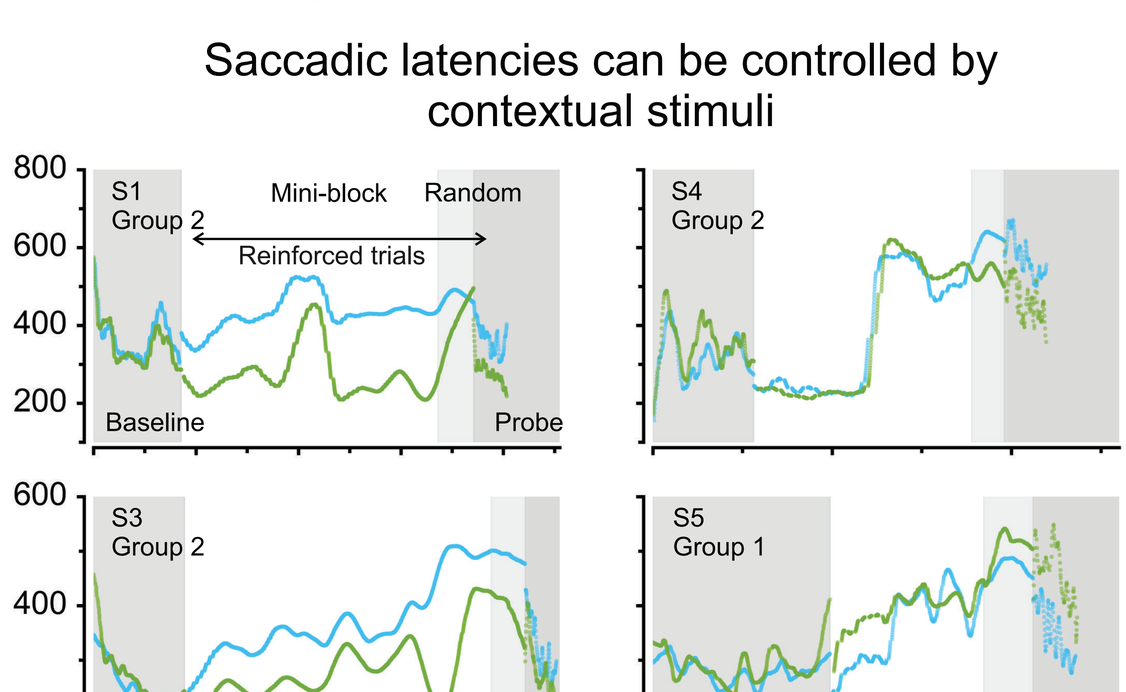
		Contextual stimuli	
		Left side	Right side
Experimental group	Group 1	RT1	RT2
	Group 2	RT2	RT1

For discrimination training, we:
1) massed trials on one side of the screen (left then right),
2) alternated blocks of consecutive left/right trials and progressively decreased their length (24-12-6-3-random),
3) conducted a probe session in which the latency-contingent display was withdrawn.

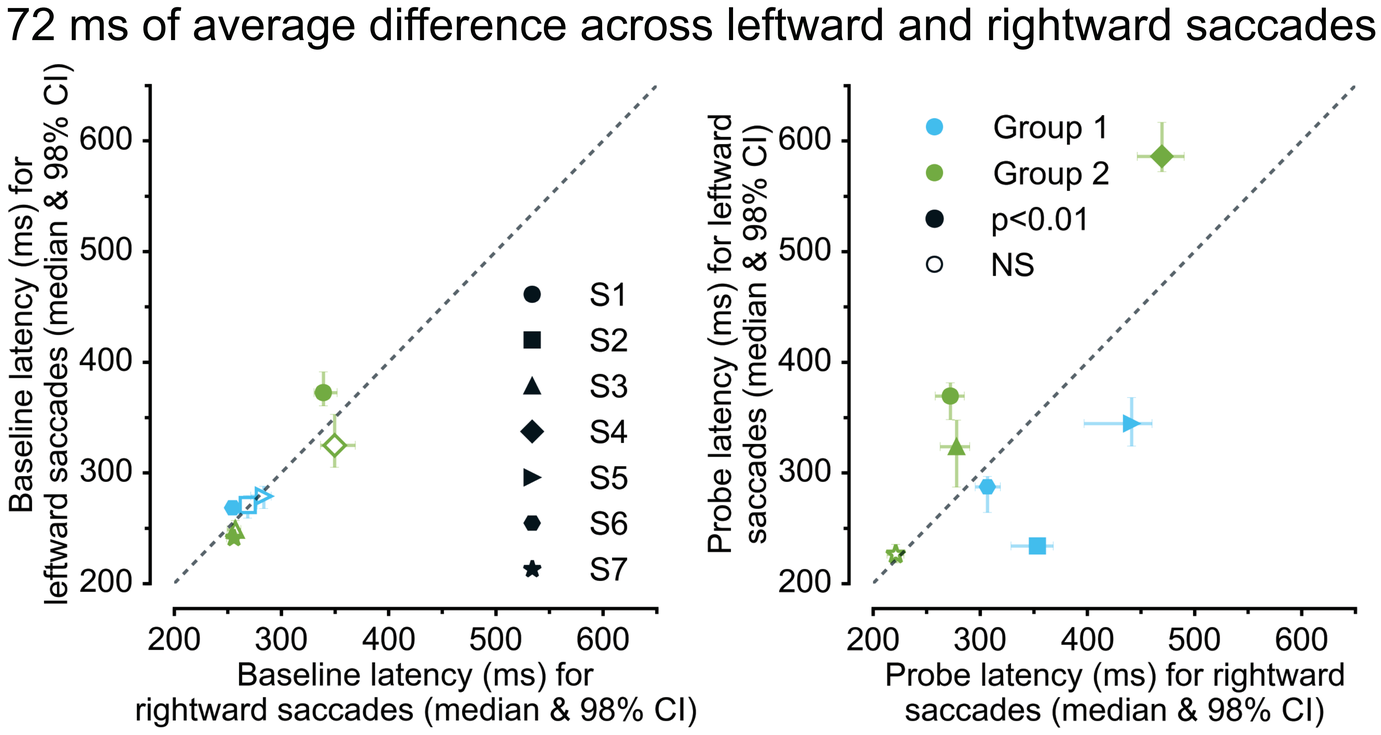
- 384 trials per session
- 30 sessions per subject
- Reinforcer = target display + 0.02€ associated with a sound

RESULTS





72 ms of average difference across leftward and rightward saccades



CONCLUSION

- Saccadic latencies can be placed under contextual control, which supports the extent of reinforcement learning for saccades.
- Further research should probe the extent of contextual control over latencies.
- Saccade triggering is finely controlled by learned temporal and spatial properties of the environment.

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REFERENCE

Hoppe & Rothkopf (2016). Learning rational temporal eye movement strategies. *PNAS*.
Vullings & Madelain (2016). Saccadic latency and choice in a concurrent random interval reinforcement schedule. *Journal of Vision.*

ANR grant ANR-13-APPR-008 and PhD grant from the French Ministry for Research