

TIME IS MONEY: TIME AS AN INCENTIVE TO IMPROVE PERFORMANCE

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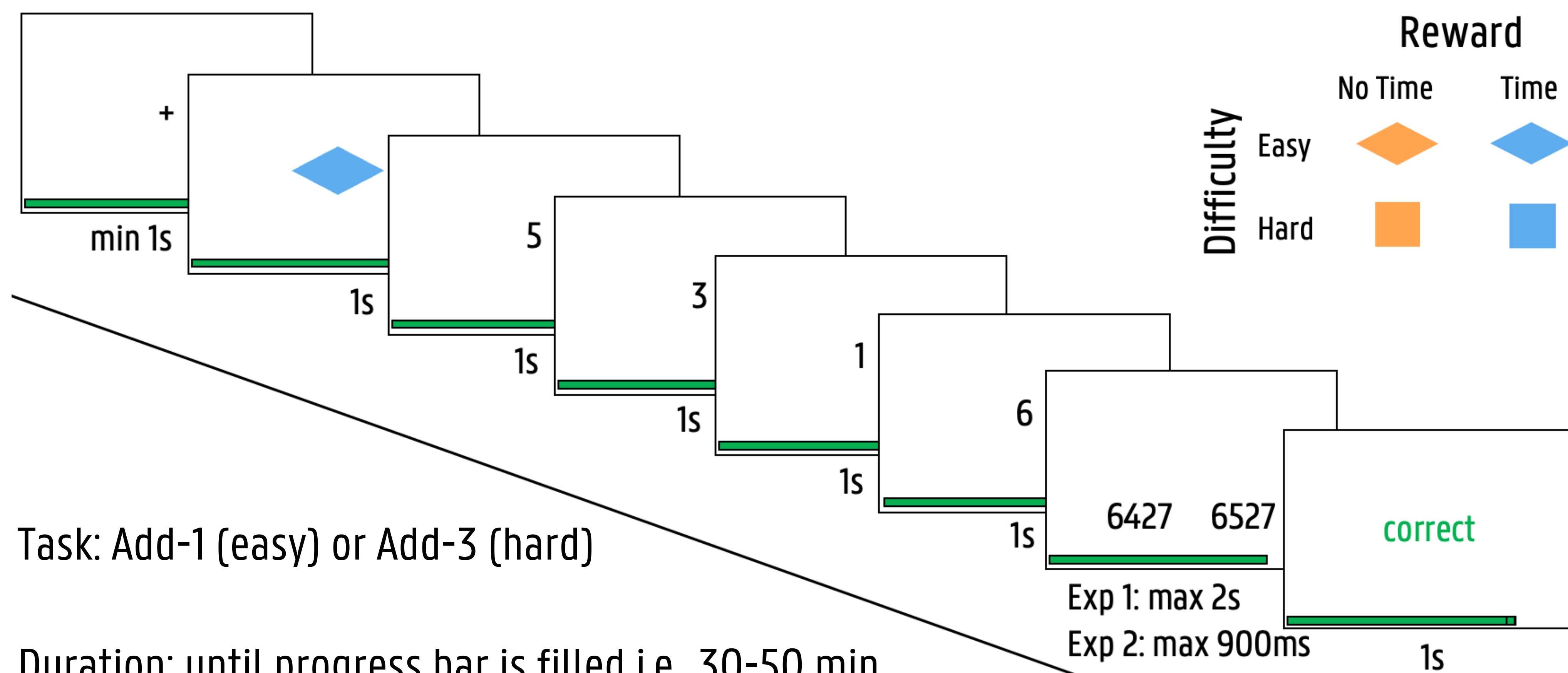
BACKGROUND

Research in the field of cognitive and computational (neuro) science has consistently supported the ‘law of least effort’, which suggests that people generally avoid expending mental effort unless potential benefits (e.g., rewards) outweigh the associated costs ⁽¹⁾.

The nature of such costs is debated, but one complementary account proposes that expenditure of mental effort to a task implies opportunity costs equal to the value of the next-best use of those mental resources ⁽²⁾. Accordingly, opportunity costs scale with task duration and task difficulty.

In two experiments, we directly tested this account to see whether predictions of shorter task duration and lower task difficulty decrease opportunity costs (i.e., increase effort expenditure) and how these affect the speed (drift rate, ν) and cautiousness (boundary, α) of the underlying decision process.

METHOD



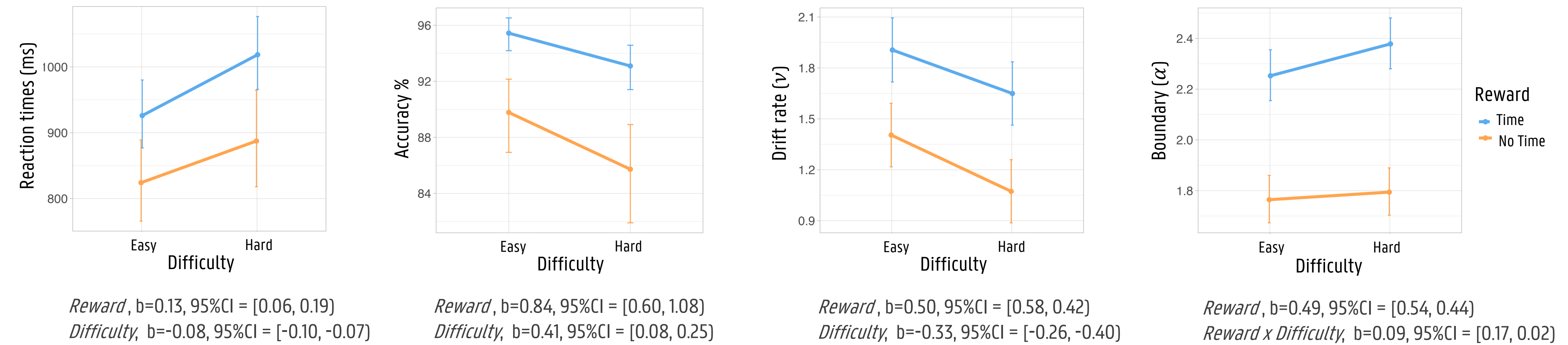
Task: Add-1 (easy) or Add-3 (hard)

Duration: until progress bar is filled i.e., 30-50 min (depending on accumulated Time reward)

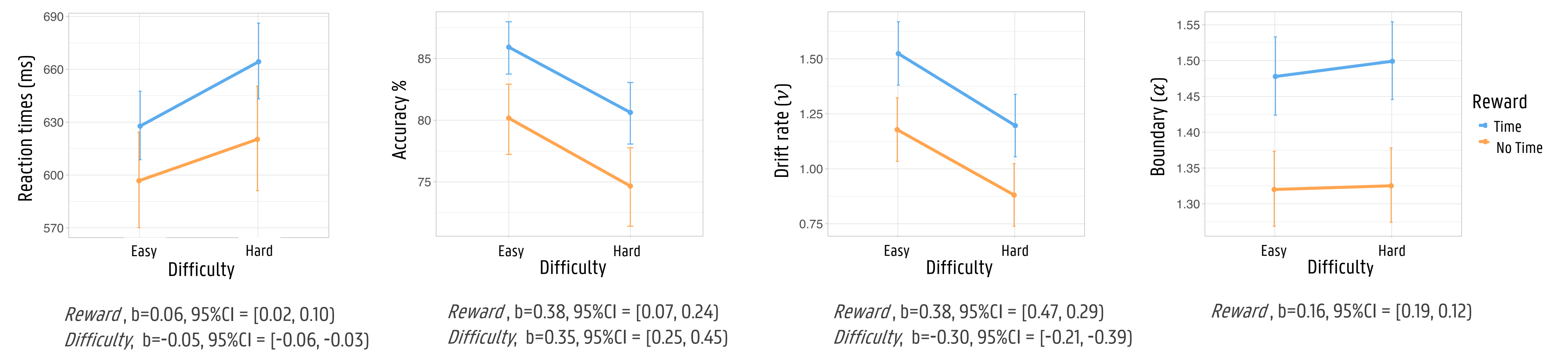
Lenient (Experiment 1, N=60) vs stricter response deadline (Experiment 2, N=80)

RESULTS

EXPERIMENT 1



EXPERIMENT 2



DISCUSSION

Despite the stricter deadline in Experiment 2 participants showed a comparable speed-accuracy tradeoff across experiments. Since Time rewards were contingent on solely accuracy and trial duration was fixed, participants were overall more accurate in response to those trials, at the cost of exhibiting longer response times. These findings align with the opportunity cost account, suggesting that allocating more time on a trial to ensure accuracy is less time costly than adding another trial to the experiment duration.

As expected, HDDM results revealed increased cautiousness on Time rewarded trials. Surprisingly, however, participants were also faster in accumulating evidence in response to those trials. Taken together, the findings suggest that rather than a simple strategic adaptation, the behavioral pattern on Time rewarded trials could also reflect increased mental effort expenditure (refer to Supplementary materials for posterior predictions).

[1] Shenhav, A., Musslick, S., Lieder, F., Kool, W., Griffiths, T.L., Cohen J.D., & Botvinick, M.M. (2017). Toward a rational and mechanistic account of mental effort. *Annual Review of Neuroscience*, 40(1), 99-124. [2] Kurzban, R., Duckworth, A., Kable, J. W., & Myers, J. (2013). An opportunity cost model of subjective effort and task performance. *Behavioral and Brain Sciences*, 36(6), 661-679.