Discerning Mouse Trajectory Features with the Drift Diffusion Model

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Introduction

Mouse-tracking is a new and popular action-based measure of behavior. However, its usage rests on two untested assumptions: (a) that keypress and mouse movement designs elicit the same decision processes; (b) that mouse movement features can be linked directly to the implicit processes in one's mind.

Questions:

- Do people use comparable decision processes in tasks with keypress and mouse movement designs?
- Do the mouse movement features link directly to decision process parameters?

Design & Measures

Within-subjects design:

- **Delay discounting task** (mouse tracking & keypress)
- **Stop-signal task** (mouse tracking & keypress)

Drift diffusion model:

- Boundary separation (a)
- Drift rate (v)
- Nondecision time (t)

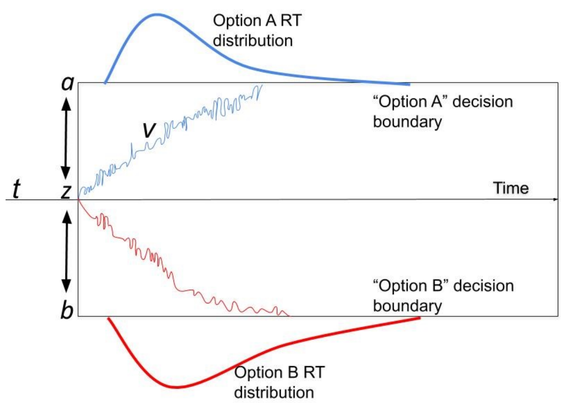

Figure 1: Drift Diffusion model

Accuracy in SST

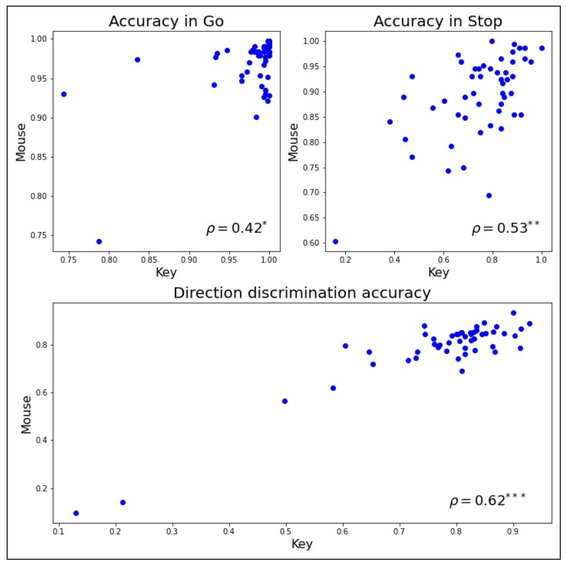

Figure 3: Accuracy in mouse and keypress SST

Tasks & Participants

Mouse movement features:

- Area under curve
- Mean max velocity
- Mean max velocity time

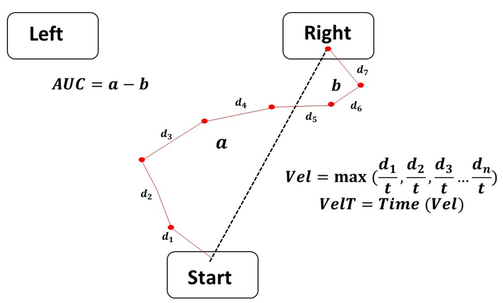

Figure 2: Calculation of measures

N participants = 51 (23 male and 28 female)

Agreement between HDDM parameters in DDT and SST

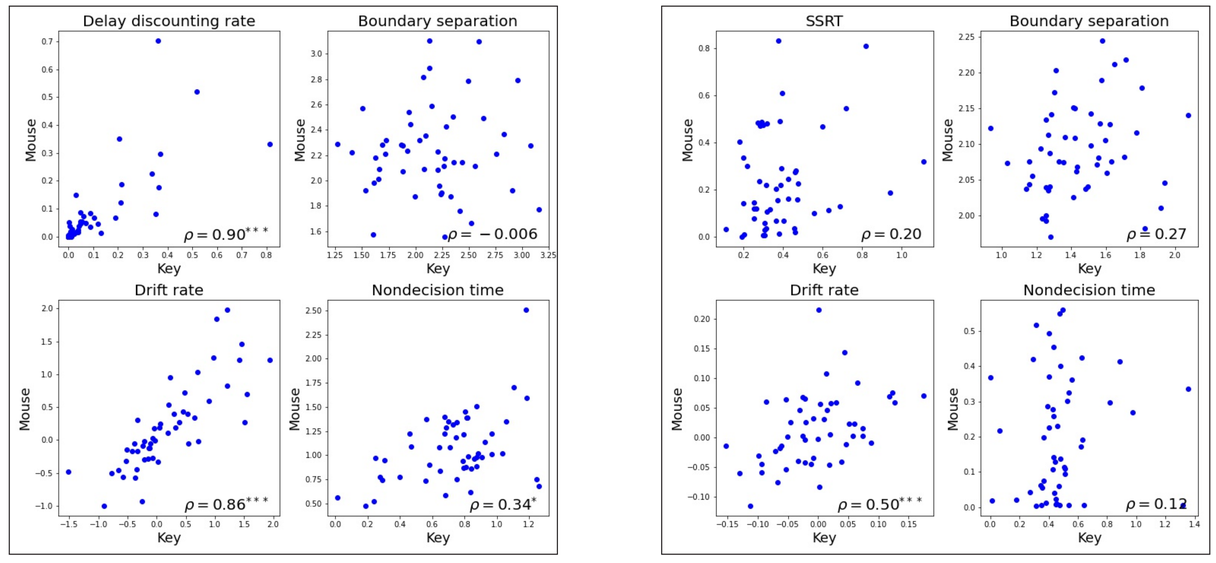

Figure 4: DDM parameters in DDT (left); DDM parameters in SST (right)

Mouse movement measures and DDM parameters

Table 1: Mouse measures and DDM parameters in DDT

	k (key)	*a* (key)	*v* (key)	*t* (key)
AUC_{ss}	-.36*	.44**	.33*	.04
Vel_{ss}	.06	-.24	-.07	-.06
$VelT_{ss}$	-.31*	.06	.29*	.09
AUC_{ll}	.09	-.12	-.11	-.03
Vel_{ll}	.08	-.29*	-.10	-.27
$VelT_{ll}$	.04	.04	-.08	.20

*p<.05,**p<.01

Table 2: Mouse measures and DDM parameters in SST

	a (key)	*v* (key)	*t* (key)
AUC_{go}	-.07	.24	-.25
Vel_{go}	-.06	.11	-.04
$VelT_{go}$	.33*	-.10	.41**
AUC_{stop}	-.17	.05	-.20
Vel_{stop}	-.17	.17	-.42**
$VelT_{stop}$	.27	-.11	.29*

*p<.05,**p<.01

Discussion

- Task convergence was well preserved in the DDT, while SST was more prone to contextual factors
- AUC and other mouse measures had strong relationships with decision process parameters
- Both keypress and mouse movement versions of SST and DDT preserve individual variability associated with decision strategies well