Normalization

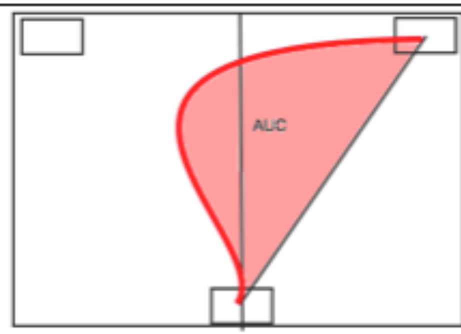
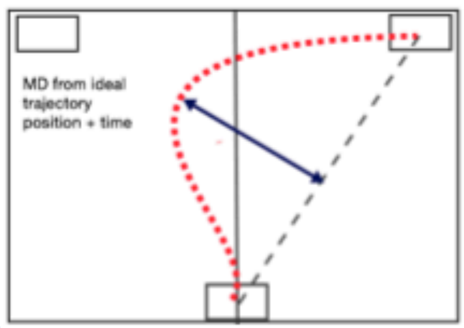
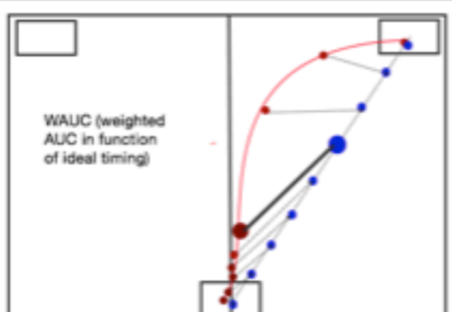
On one hand, variations in response times imply different quantity of *x,y* positions per trial, making difficult the comparisons between items. On the other hand, in our design, positions are extracted based on mouse movements, and devices with more or less sensibility could influence the number of samples taken during the trial.

Mouse positions are normalized according to the screen where the experiment is displayed. The normalization was done by considering the start button at the [0,0] point, the false button corner at [-1,1] and the "true" button at [1,1]

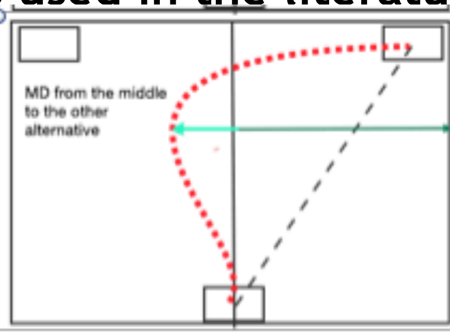
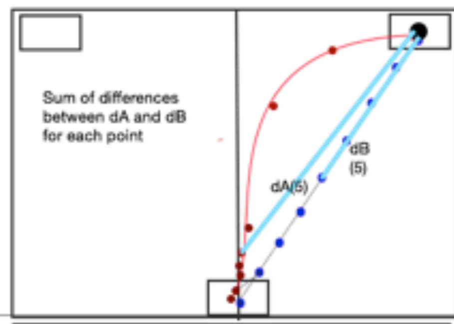
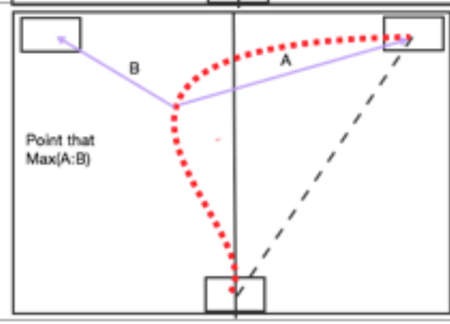
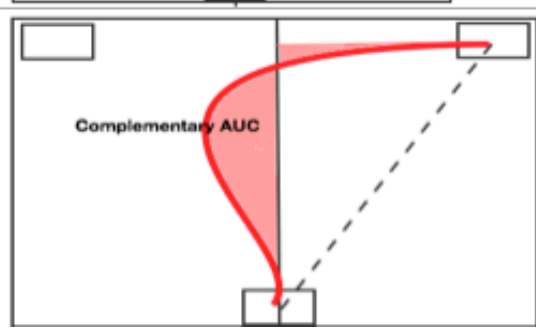
Normalization in time: we normalized by interpolation the time course into 101 proportional times steps (percentage of trial duration) (This is what I do)

Normalization in space: we normalised the x,y positions to be equally spaced given the total length of the trial.

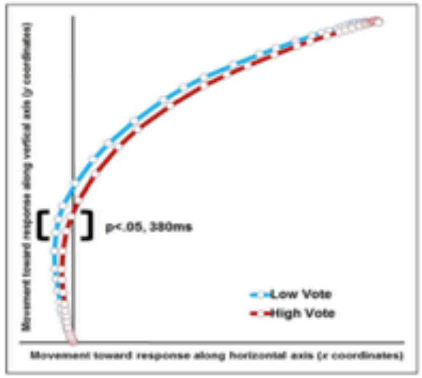
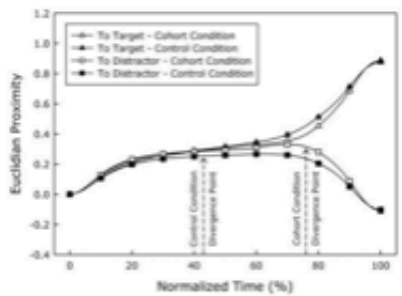
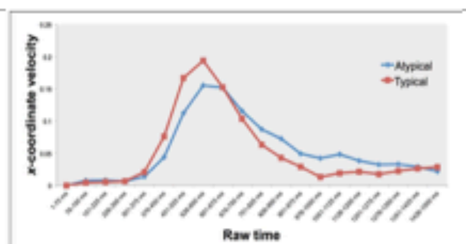
Different measures used in the literature

MEASURE	What it measures?	Example	How to do it?	Interpretation	????
Mouse-trajectory deviations					
Area Under the Curve (AUC)	Attraction of the non-chosen alternative		Area between the curve and the ideal trajectory. The area that is below the ideal trajectory is counted as negative.	Higher AUC values are interpreted as more attraction to the unselected alternative. While lower or negative AUC are interpreted as a decision made for the ultimately selected alternative.	
Maximum Deviation (from ideal trajectory)	Final decision point		Point that maximizes the perpendicular distance between the ideal trajectory and the actual trajectory. For two points with same x, the MD will be higher, the higher in the path appears.	Giving that the ideal trajectory is the one that one would do when you are decided, the moment in which you start to came back to this pattern is = MD.	We could use also a measu of how much it passes th middle
Weighted Area Under the Curve (WAUC) and MD for WAUC	Delay in decision		Ideal point distribution on ideal trajectory. Area based on the distance between each ideal point and the actual point.	The points are not uniformly distributed because people spend more time in some places than in others. In order to take into account this (to penalize subjects that stay too long at the begining, for example)	

Different measures used in the literature

Maximum Deviation (from the target side) in the opposite side	Also decision point if we take into account the moment. + attraction of alternative			With this measure we can be sure of whether the subject went to the other side or not. However, this measure doesn't take into account the moment in the derivation where the MD occurs (it's not weighted, like the Ratio)	
Difference of distance btw real positions and ideal positions					
Point that maximizes tha ratio between target and foil alternatives	Deviation towards unselected alternative		For each trial, the time and the x,y coordenates that maximize the distance.		
Area between curve and middle (complementary of AUC)	Uncertanty			How much I say in the middle? (because basically I don't know what to do)	

Different measures used in the literature

MEASURE	What it measures?	Example	How to do it?	Interpretation	????
		Temporal measurements			
Time in which position predicts condition	When two conditions start to be different		Moment in which the position of one condition (x,y) is significantly different from the position of the other one. In order to do this is necessary to have a temporal average of all the subjects (some kind of normalization in time + not much variability in RT per condition)	Giving that our two conditions suppose different derivations, I don't think this is very useful. Of course we predict that they will be different very quickly. Something different could be if we mirror I condition. So we could see how the first part of I diverges from the first part of S.	
Euclidean proximity to each alternative in time	Uncertantly + different decision points per condition		1- distance/max(distance) = Similar to ratio but continuous measure for both sides, and taking into account time (averaging all trajectories, instead of taking one point per trial). For time step of each trial condition, take ED to each option and compare the difference between them (stat).	Clear idea of decision dynamics for each condition. At what moment they start the decision is made for each condition? In one or other direction	
Peak velocities and acceleration	Dynamis of possible competition		Difference between subsequent coordenates at different raw time points (acceleration = changes of velocity across time points)	If two alternatives are competing between them, it's predicted that it would be an initial decrease in the velocity folloed by an acceleration when the decision is made.	
MEASURE	**What it measures?**	**Example**	**How to do it?**	**Interpretation**	**????**
		Spatial disorder analysis			
x-flips and y-flips	Stress and complexity in one trajectory		Directional shifts / Sample entropy		
Trajectory shape, smooth/abrupt?					

Does the derivation of representation A suppose the derivation of representation B?

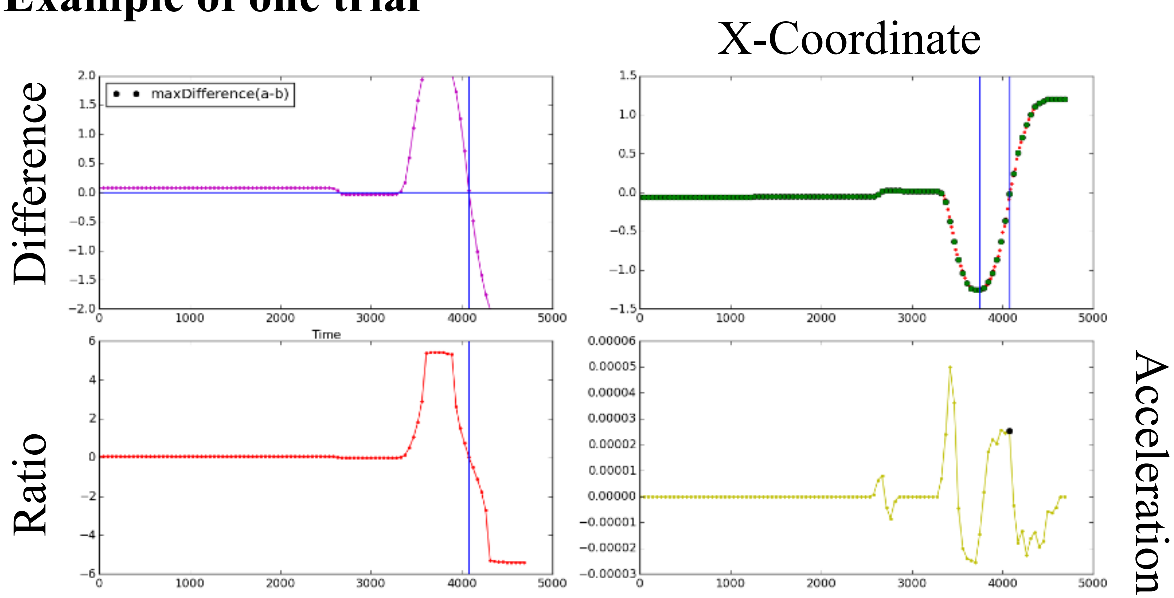
Deviation towards unselected alternative?

- Ratio of distances
- Difference of distances
- Acceleration peaks (acceleration points = decision point)
- Deviation towards the unselected alternative (also equals decision point)

Value at some point of the derivation

Area between two points (taking into account uncertainty)

Example of one trial



<table>
<tr><th colspan="7">WHEN? Moment when we are going to look it</th></tr>
<tr><th colspan="2">A = distance to target
B = distance to alternative</th><th>Max Ratio (last)</th><th>Max Difference (last)</th><th>Acceleration Peak (last)</th><th>Max Deviation</th><th>Min X-Coordinate</th></tr>
<tr><td rowspan="10">WHAT? Measure that we are going to look</td><td rowspan="2">Ratio (A/B)
R > 1: Alternative
R = 1: Middle
R < 1: Target</td><td>MaxRatio</td><td>Ratio at MaxDifference.
Correlated (?).</td><td>Ratio at Acceleration peak
Was I at the other side when I took the decision?</td><td>Ratio at Max Deviation
Only correlated if I was in the other side.</td><td>Ratio at Min X-Coordinate
Correlated (?).</td></tr>
<tr><td colspan="5">AUC btw time 0 and time-value
Insensitive to changes of direction because of exponential values.</td></tr>
<tr><td rowspan="2">LogRatio
LR > 0: Alternative
LR = 0: Middle
LR < 0: Target</td><td>MaxLogRatio</td><td>Possibly correlated</td><td>LogRatio at AccPeak</td><td>LogRatio at MaxDev</td><td>Possibly correlated</td></tr>
<tr><td>-</td><td>-</td><td colspan="2">AUC btw time 0 and time-value
Solves the problem of extreme values
Values closer to 0 = uncertainty until decision</td><td>-</td></tr>
<tr><td rowspan="2">Difference (A-B)
D > 0: Alternative
D = 0: Middle
D < 0: Target</td><td>Diff at MaxRatio
Correlated (?).</td><td>MaxDifference</td><td>Difference at Acceleration Peak</td><td>Difference at Max Deviation</td><td>Difference at Min X-Coordinate</td></tr>
<tr><td>-</td><td>-</td><td colspan="2">AUC btw time 0 and time-value
Similar to LogRatio, but less sensitive</td><td>-</td></tr>
<tr><td>Acceleration
A = Decision point?</td><td>-</td><td>-</td><td>Max Acceleration
(Noisy. I don't think this is really informative)</td><td>-</td><td>-</td></tr>
<tr><td>Deviation
From ideal trajectory
Decision point?</td><td>-</td><td>-</td><td>-</td><td>MaxDeviation
Not informative about "being in the other side"</td><td>-</td></tr>
<tr><td rowspan="2">X-coordinate
X = 0: Middle
X < 0: Alternative
X > 0: Target</td><td>X-Coordinate at MaxRatio</td><td>X-Coordinate at MaxDifference</td><td>X-Coordinate at AccPeak</td><td>X-Coordinate at MaxDeviation</td><td>Min X-Coordinate</td></tr>
<tr><td colspan="5">AUC btw time 0 and time-value
Negative values = more in the target side</td></tr>
</table>

Some predictions (validation of measurements in experiment done by myself)