A

**instruction**

You will be presented with 2 stimuli
At first there will be no gap between them
We will then introduce an increasing gap
After each trial tell us whether you feel
one stimulus “same” or two stimuli “different”
or whether you can identify the location
of the first stimulus “index finger” or “middle finger”

**stimuli**

Verbal response

Options:
“same”
“different”
“index”
“middle”

**response**

B

**Non-sensory factors**

age, sex, intelligence, attention/concentration
influence of bias (predictable design), experimenter instruction (may have strong prior)
value/cost assigned to each answer (motivation, personality, whether patient or control)

**Sensory encoding**

→ **Sensory integration**

→ **Executive demand**

→ **Response output**

somatosensory
visual
timing

temporal
spatial
detection of change

Decision 1: same or different
Decision 2: topography

speech area
motor execution
of speech

C

**abnormal temporal discrimination**

hypokinetic movement disorders
Parkinson’s disease
PINK1 homo- and hetero-zygotes
MSA

hyperkinetic movement disorders
cervical dystonia
first degree relatives of cervical dystonia
blepharospasm
spasmodic dystonia
writing dystonia, musician’s dystonia
DYT1 dystonia
non-manifesting DYT1 mutation carriers
isolated head and voice tremor
Supplementary Figure 3.

rho = 0.51
p = .0010

rho = 0.30
p = .0570

rho = 0.64
p < .0001
Interval discrimination

A. Psychometric analysis

B. Reaction time

C. Accuracy vs reaction time

D. Drift diffusion model
Supplementary Figure 2.

A. Fixed interval = 200ms

B. Fixed interval = 50ms  Fixed interval = 100ms  Fixed interval = 200ms

I

cervical dystonia (red)
Supplementary Figure 1.
A

B

C

A CB
A

![Graph showing probability of answer "two pulses" against log interval (15 bins).]

- Blue line: control
- Red line: dystonia

<table>
<thead>
<tr>
<th>hit rate (%)</th>
<th>false pos (%)</th>
<th>T₅₀ (ms)</th>
<th>T₇₅ (ms)</th>
<th>T₉₅ (ms)</th>
<th>slope</th>
</tr>
</thead>
<tbody>
<tr>
<td>control</td>
<td>83.4</td>
<td>2.15</td>
<td>31.9</td>
<td>64.3</td>
<td>141</td>
</tr>
<tr>
<td>dystonia</td>
<td>77.4</td>
<td>1.08</td>
<td>36.6</td>
<td>88.1</td>
<td>168</td>
</tr>
<tr>
<td>p-value</td>
<td>0.197</td>
<td>0.774</td>
<td>0.302</td>
<td>0.302</td>
<td>0.707</td>
</tr>
</tbody>
</table>

B

![Histogram showing frequency of reaction times.]

- *p = .021
- *p = .013

C

![Graph showing accuracy against reaction time.]

- Blue line: control
- Red line: dystonia
A  Psychometric analysis

<table>
<thead>
<tr>
<th>symbol</th>
<th>parameter</th>
<th>interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>T50</td>
<td>0.50 threshold</td>
<td>sensitivity measure at different levels of response certainty</td>
</tr>
<tr>
<td>T75</td>
<td>0.75 threshold</td>
<td></td>
</tr>
<tr>
<td>T98</td>
<td>0.98 threshold</td>
<td></td>
</tr>
<tr>
<td>-</td>
<td>0.50 slope</td>
<td>acuity/range of parameter over which decision difficult</td>
</tr>
</tbody>
</table>

Subject 1

Subject 2

B  Drift diffusion model

<table>
<thead>
<tr>
<th>parameter</th>
<th>interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>nondecision time</td>
<td>sum of all other processes involved (sensory encoding, motor execution of response)</td>
</tr>
<tr>
<td>drift rate</td>
<td>quality of stimulus, amount of input information</td>
</tr>
<tr>
<td>decision boundary</td>
<td>criterion setting/speed-accuracy trade off</td>
</tr>
</tbody>
</table>

Evidence

drift rate

decision boundary

time (ms)