

## Dynocog

We're a cognitive neuroscience research unit comparing human vs AI learning in dynamic tasks.

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### Theoretical Write

I wrote up the experiments - please skim read.

Questions:

- WCST is primarily used for assessing brain dysfunctions:
- Is it sufficiently difficult as a learning task?
- People learn the rules almost immediately.

### Experiment Setup

The experiments are live on Psytoolkit:

WCST:	<a href="https://www.psychtoolkit.org/c/3.3.0/survey?s=4UGss">https://www.psychtoolkit.org/c/3.3.0/survey?s=4UGss</a>
Backward Corsi Span Task:	<a href="https://www.psychtoolkit.org/c/3.3.0/survey?s=Hy6nz">https://www.psychtoolkit.org/c/3.3.0/survey?s=Hy6nz</a>
Corsi Span Task:	<a href="https://www.psychtoolkit.org/c/3.3.0/survey?s=VWjYN">https://www.psychtoolkit.org/c/3.3.0/survey?s=VWjYN</a>
N Back Task:	<a href="https://www.psychtoolkit.org/c/3.3.0/survey?s=kYTDd">https://www.psychtoolkit.org/c/3.3.0/survey?s=kYTDd</a>
Navon Task:	<a href="https://www.psychtoolkit.org/c/3.3.0/survey?s=8vkzM">https://www.psychtoolkit.org/c/3.3.0/survey?s=8vkzM</a>
Fitts' Law Task:	<a href="https://www.psychtoolkit.org/c/3.3.0/survey?s=LQrMM">https://www.psychtoolkit.org/c/3.3.0/survey?s=LQrMM</a>

All appear to work fine, however:

- Do we need a unique identifier (across tasks! Not sure how to do this)
  - Possibly through AWS ID?
  - Test batch (psychtoolkit)?
- MTurk setup - need money to run \$\$\$

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## Task Descriptions

Assess working memory:

- N-back
- Corsi
- Corsi backwards

Two complimentary tasks:

- Navon
- Fitt's

Working memory is probed because it's also a key executive function in WCST, and we can use it to corroborate RL model outcomes. We have three tasks so we can test them and decide which to select. Navon helps to relate the subjects to my other dataset (because it also probes local/global attention), and Fitt's is included to provide a covariate if we use Corsi.

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## Model Implementation

Haven't yet reimplemented it:

- There's ALOT of code.
- LARGE datafiles.
- It's a perfect case study (from data storage to implementation).

I wrote a notebook that allows one to examine the available structure.

Studying: STAN userguide

I need to start with STAN

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## Next Steps

For reference available on my GitHub:

<https://github.com/ZachWolpe/Dynocog>

Questions:

1. Anyone have experience with probabilistic programming? - it's AWESOME!
2. Is the WCST game sufficient to measure any learning?

What's next:

1. Collect data
2. Play with STAN models
3. Implement in MTurk (\$\$\$)
4. Design RL Model (WCST)
5. Additional Time: write up RL + Hierarchical Bayesian theory
6. ...?

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## Advice: PhD Programs

Though it may be premature, I'm growing increasingly interested in PhD programs: particularly specialised research units/team:

- Gatsby Neuroscience Lab UCL (best chance?)
- MIT Media Lab
- Cambridge PhD ML
- US CSAIL Labs (Unattainable); Deepmind; CERN

Do great work: I know that the first step is to do great work during my MSc, however these programs are so competitive I feel I need to start looking for any edge I can get?

1. This is my personal goal.
2. It appears to need deliberate planning.

As established academics I'm certain you both have insight/direction as to how I can maximise my chances of being selected for one of these programs. As such:

**1. Advice as we go is welcome!**

**2. Additional small projects that would boost my chances?**