Experimental Design: Introduction to PsychoPy

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OTC:

Link with assessment

Order	Task	%
1	Design, build & explain an experiment	40
2	Write up how to lab instructions include checklist for nibs	10
3	Write up how to lab instructions include checklist for recording	10
4	EEG recording demonstration & NIBS stimulation	p/f
5	EEG analysis write up	40

Overview

- Experimental research design – recap.
- Why computational control?
- Using a software
- Gorilla

Experimental research design

- Experimental research involves a direct assessment of how one variable influences another
- This allows the **establishment of causality**
- All extraneous variables must be held constant while a single variable is manipulated and the effect measured

Essential characteristics of experimental research

Control - Manipulation - Observation

Computational management

- Key tenants of experimental design:
  - Control
  - Manipulation
  - Observation

- All require careful management of stimuli.
- Management of stimuli is most commonly achieved by computer control.

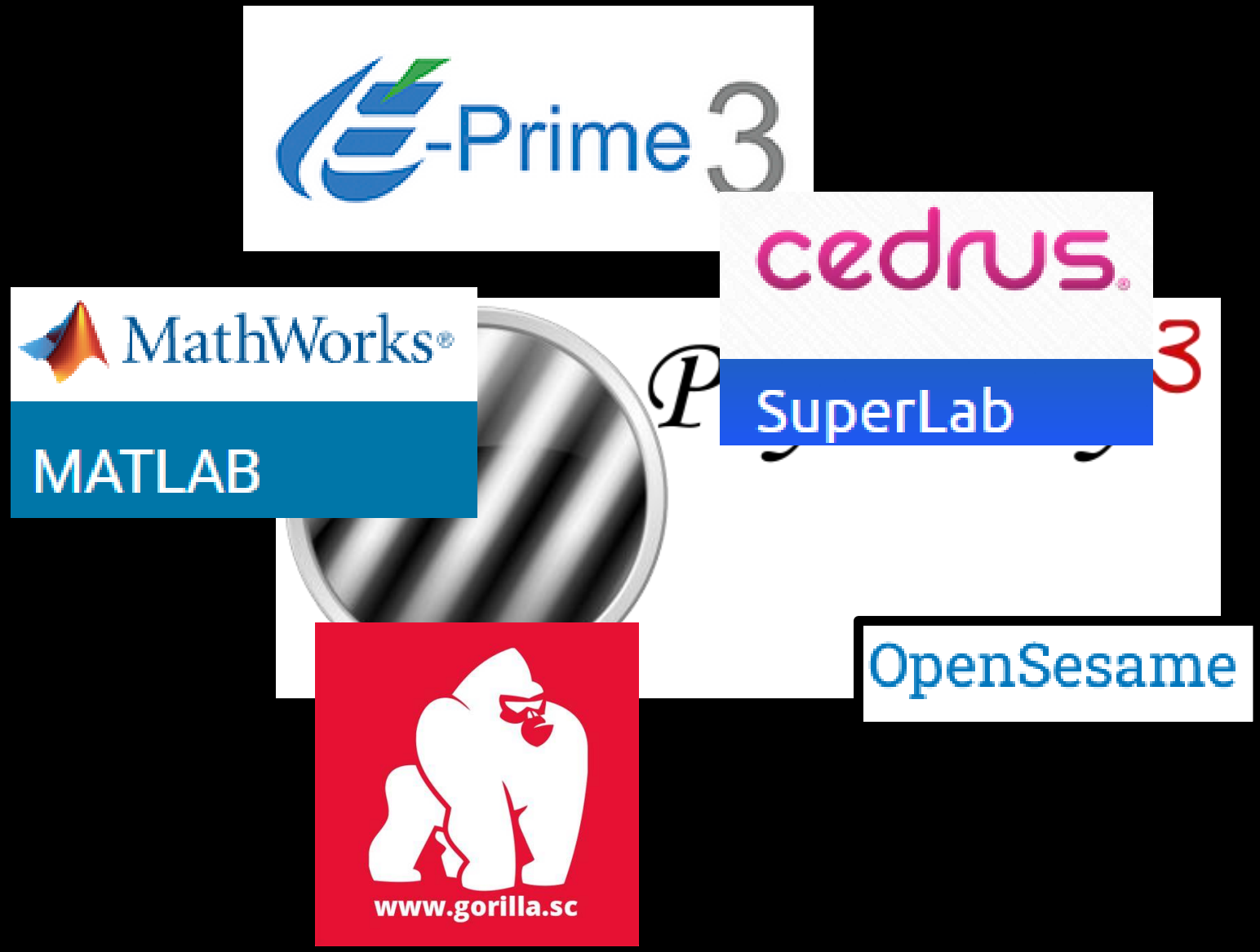
Exceptions

- Treatment based experimental designs.
  - E.g., Clinical trials.

- Quasi experimental design.
  - Lacking in either randomisation or control.
  - E.g., naturally occurring groups.

Common cognitive neuroscience designs

- Manipulation of stimuli
  - Where something appears
  - When something appears
  - What it looks like
  - What category it belongs in
- Manipulation of task
  - Attention
  - Memory
  - Working memory
  - Detection/perception


E-Prime 3
cedrus
MathWorks
MATLAB
SuperLab
OpenSesame
www.gorilla.sc

University of Nottingham
UK | CHINA | MALAYSIA

python™

Easy
enough for teaching

Precise
enough for psychophysics

Flexible
enough for everything else

Online
or lab-based, your choice

Open Science
because it's what we do

- PsychoPy® is a free cross-platform package allowing you to run a wide range of experiments in behavioural sciences (cognitive neuroscience, psychology, psychophysics, linguistics...)
  - A community-based project.
  - Users have all the source code.
  - Users are the developers.

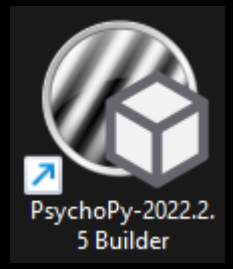
PsychoPy for PSY4061

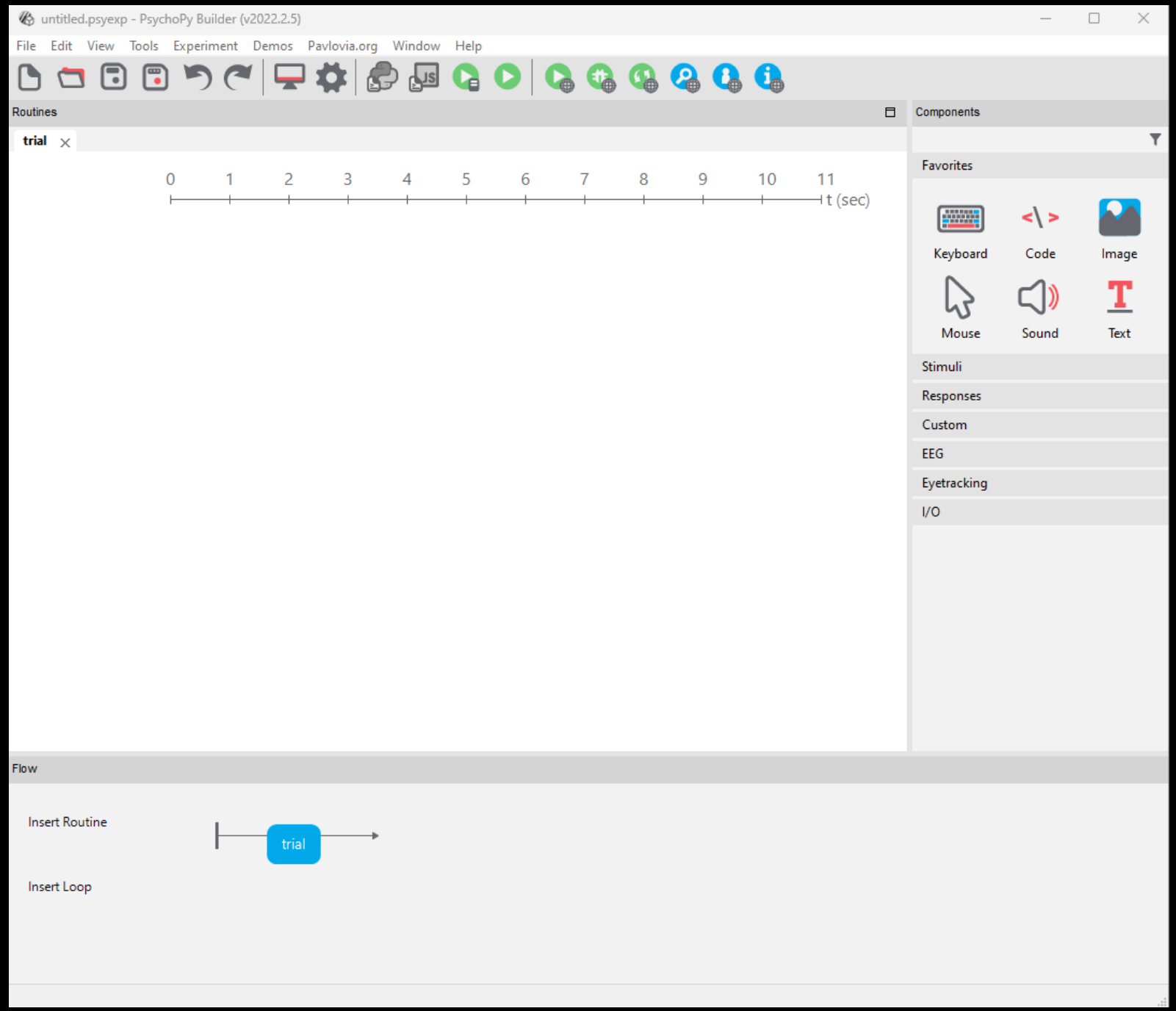
- Graphic User Interface (GUI) or script-based interface.
- Incremental learning approach.
- No code necessary (sort of).
- A gentle introduction to python!

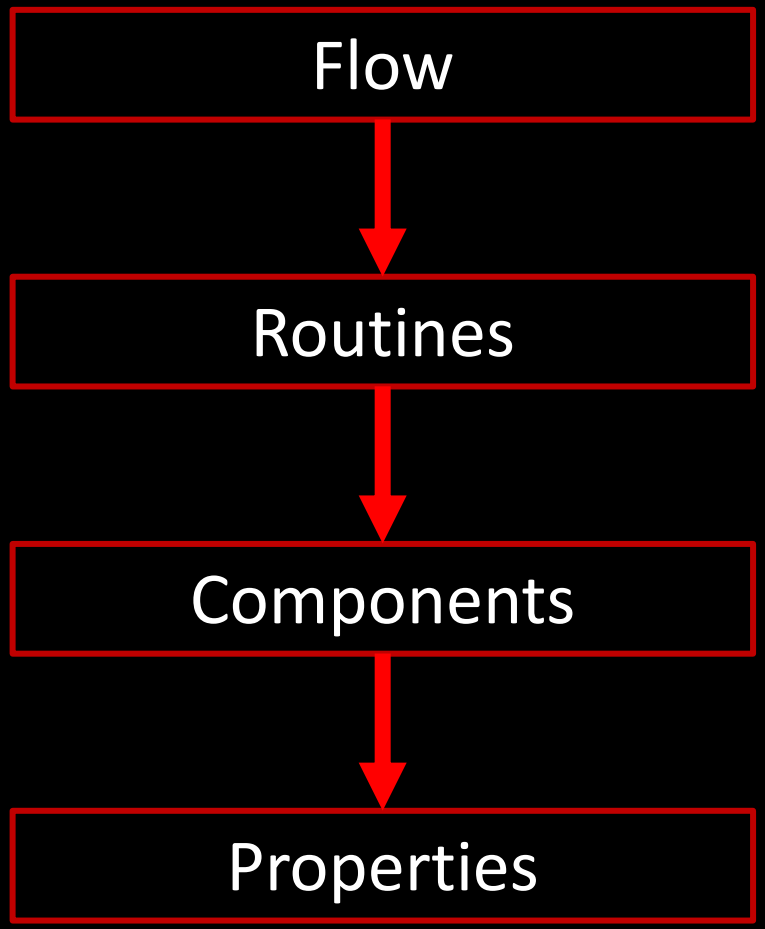
Teaching a software…?

- Quick and general overview – help you navigate.
- Learn by doing.
- Teaching application of theory.

PsychoPy Builder






Flow
Routines
Components
Properties

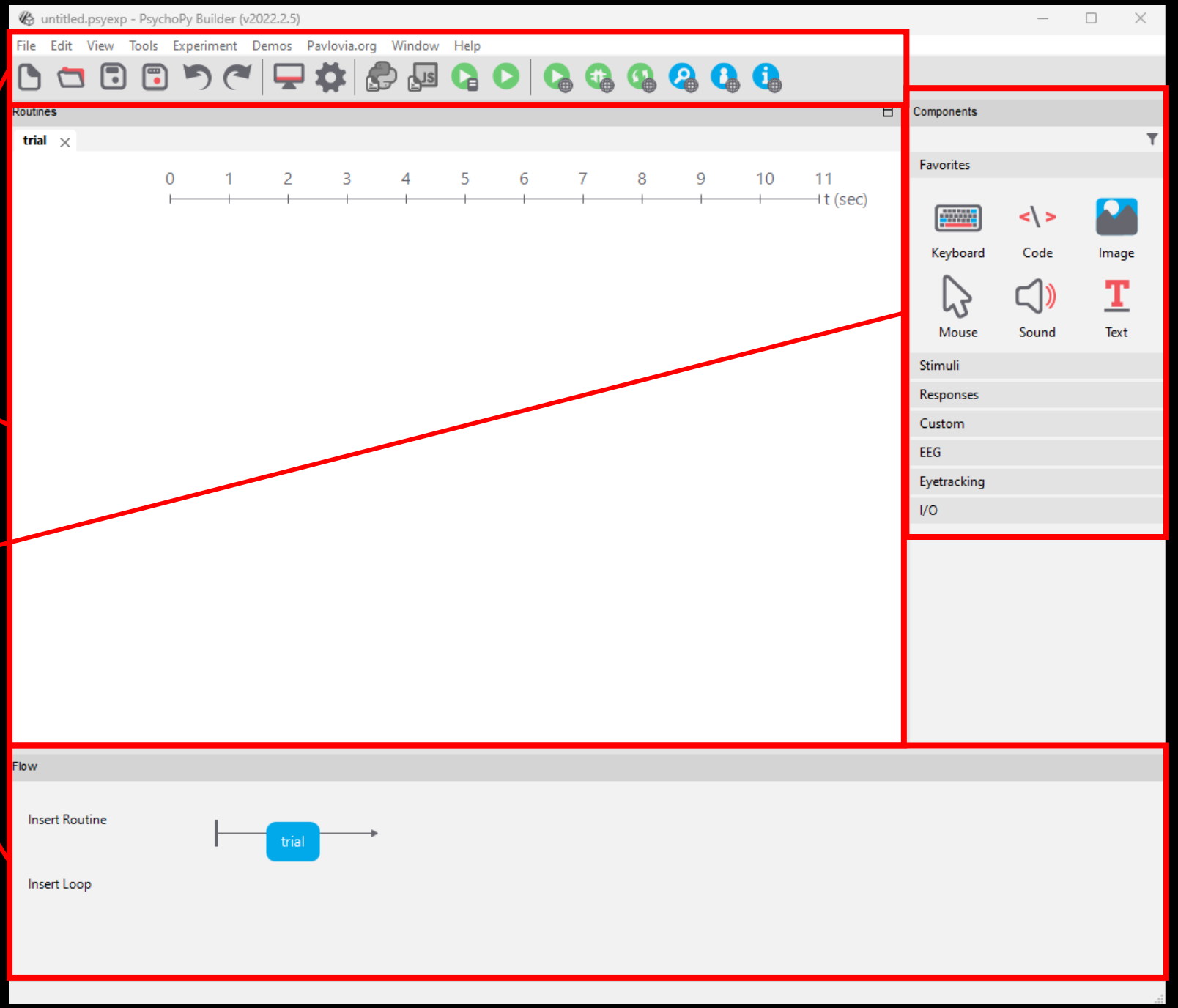
PsychoPy Builder

Menu bar & buttons

Routine space

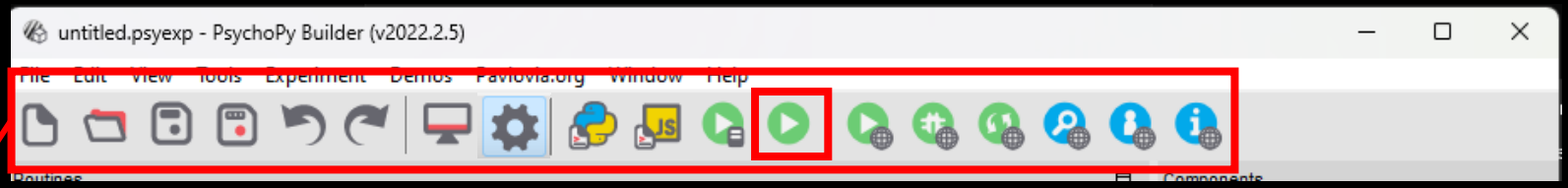
Components

Flow space



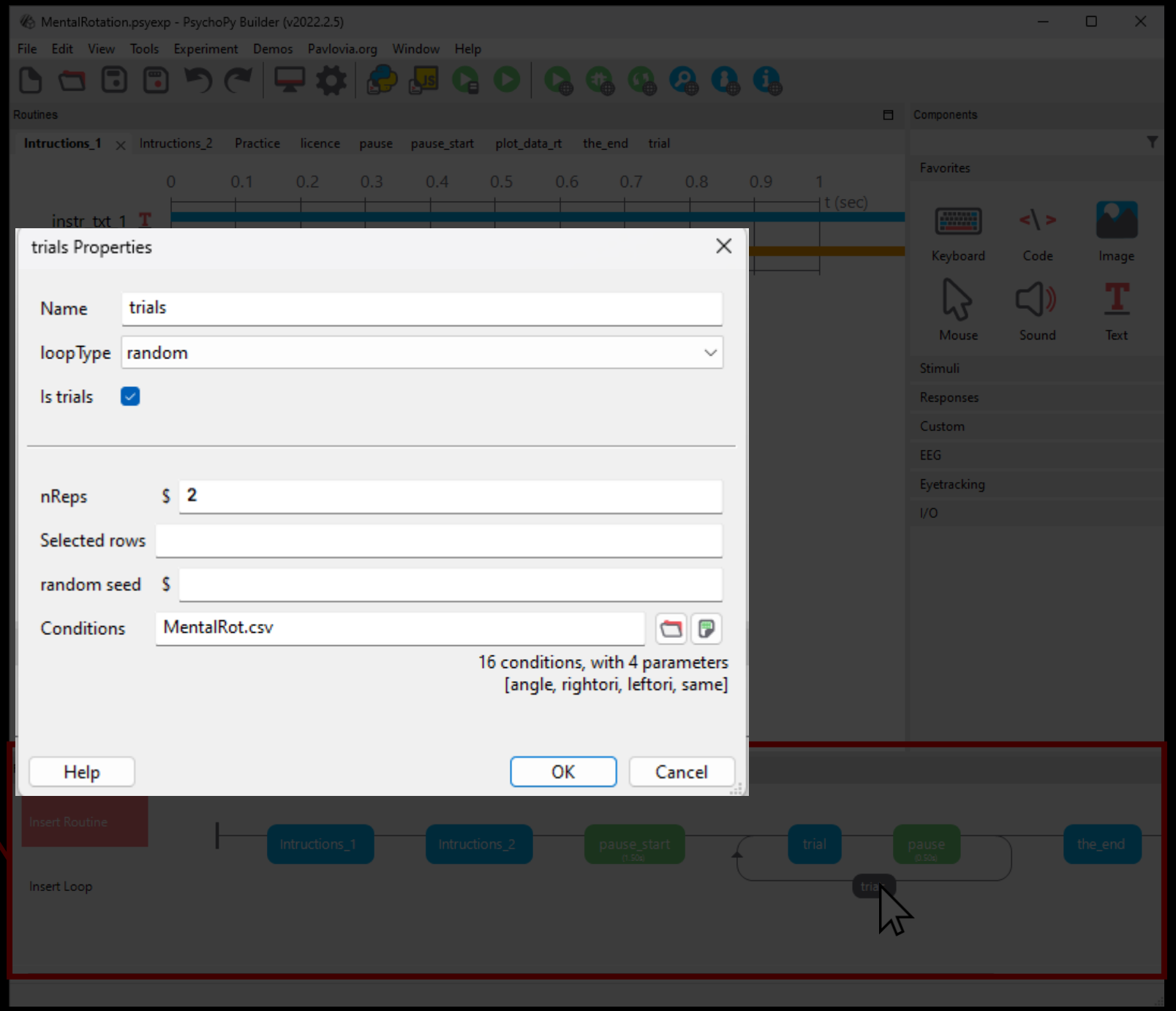
PsychoPy Builder

Menu bar & buttons



PsychoPy Builder

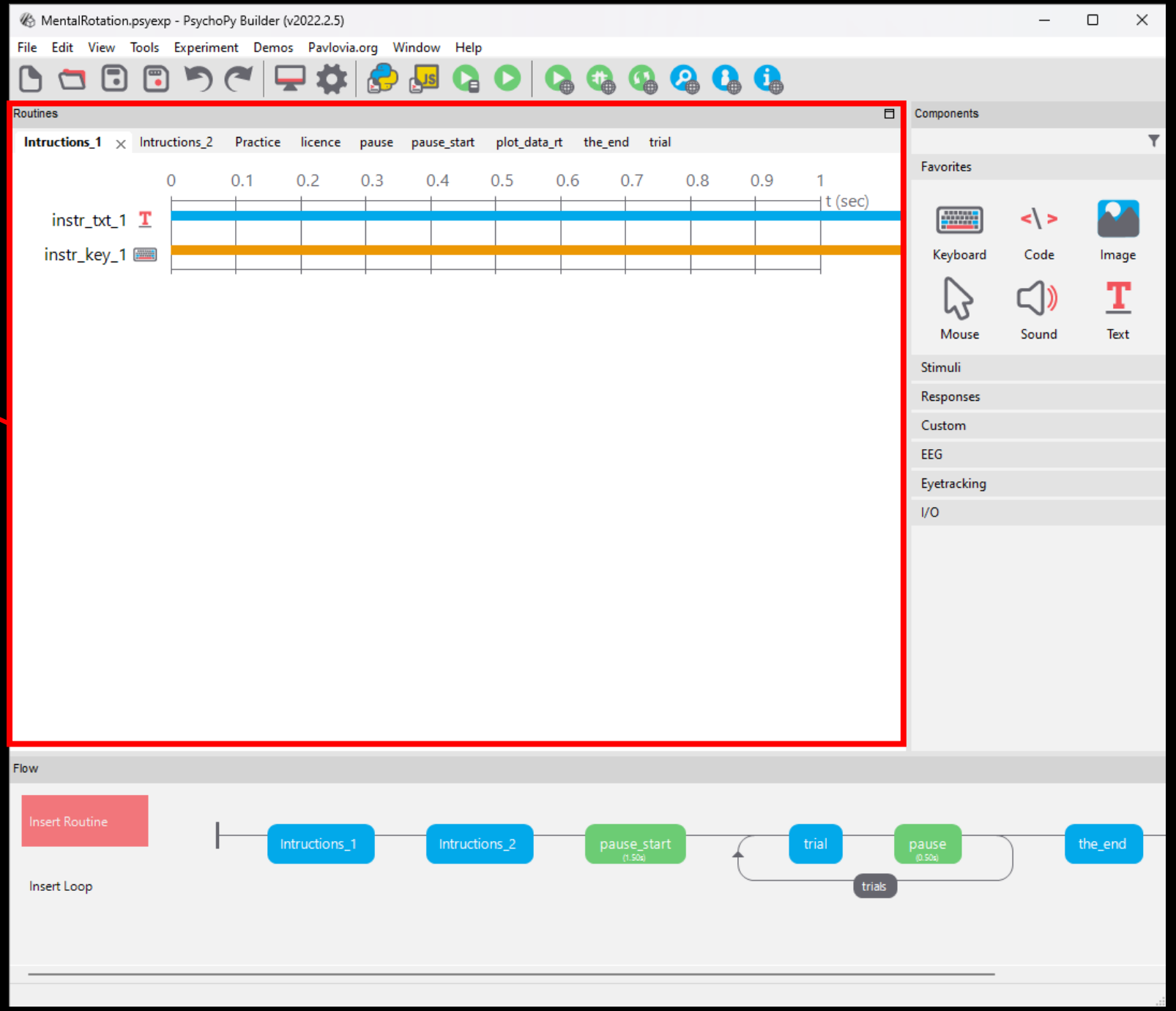
Loop properties



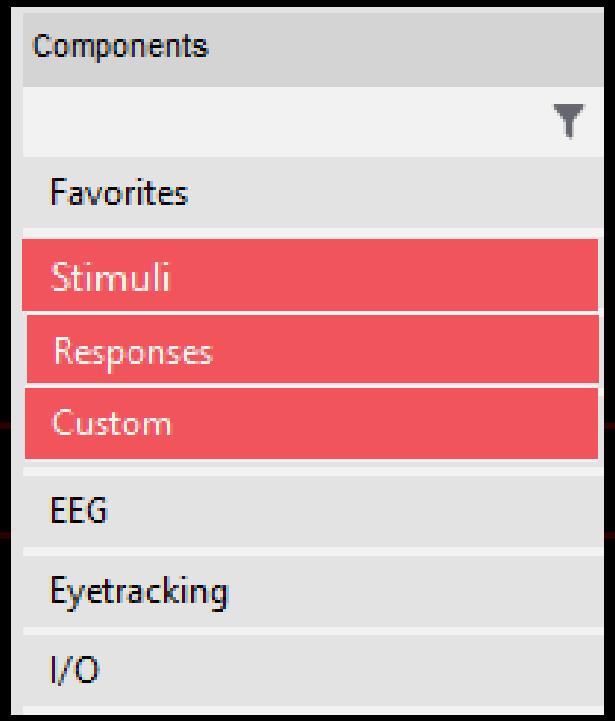
Flow space

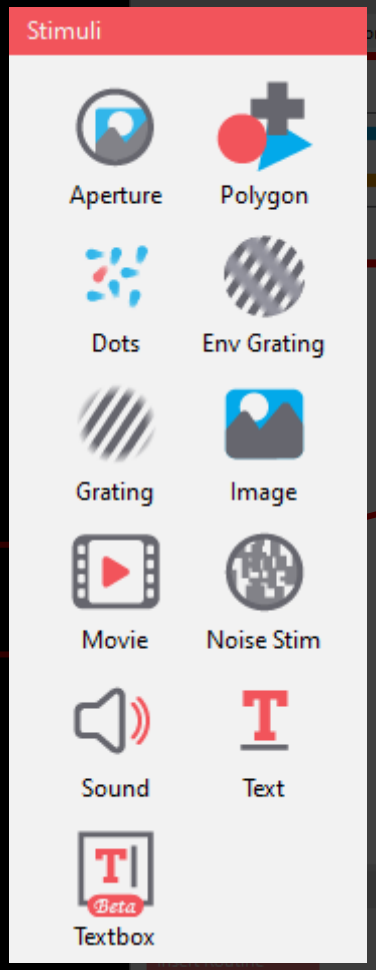
PsychoPy Builder

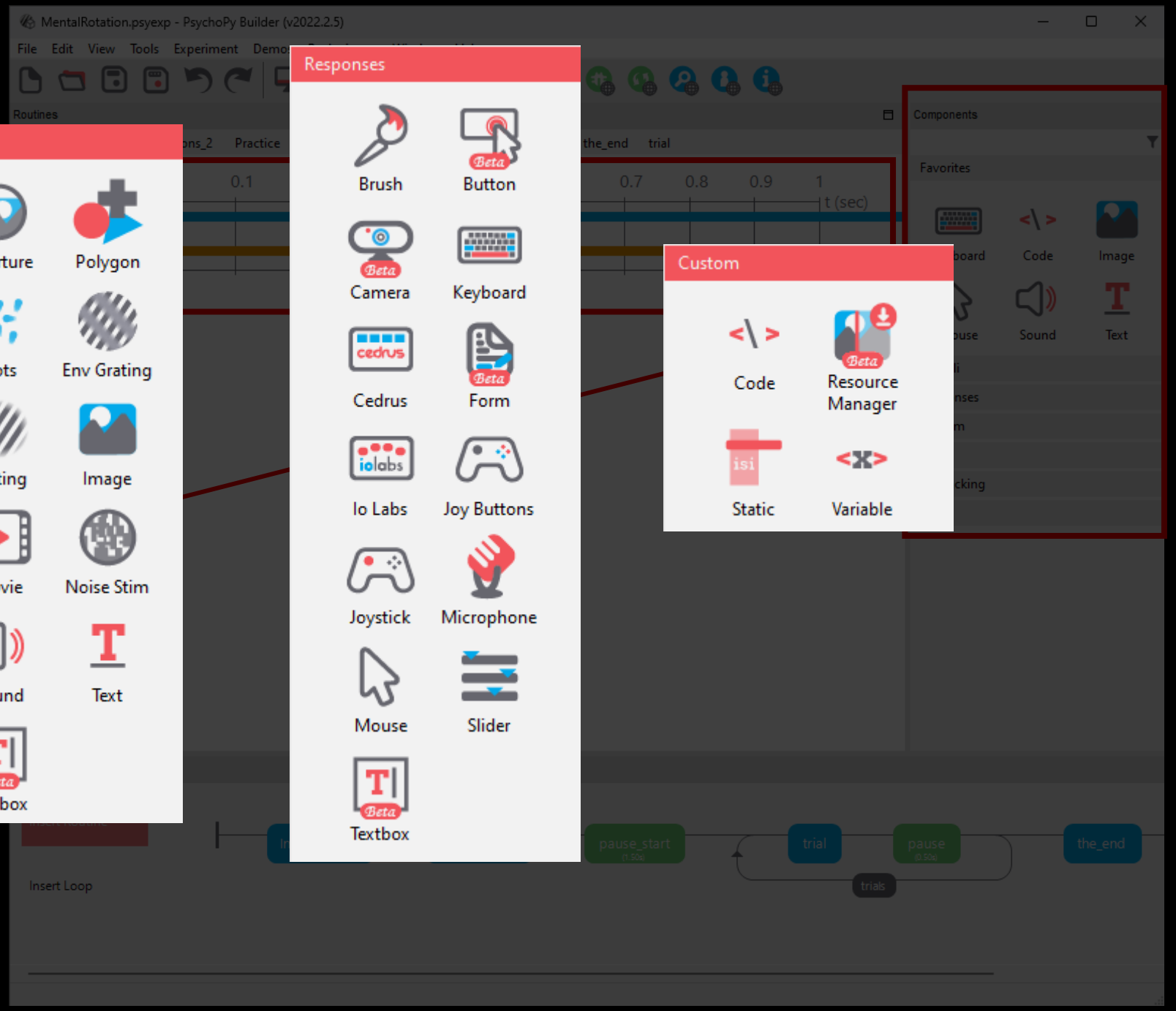
Routine space



PsychoPy Builder



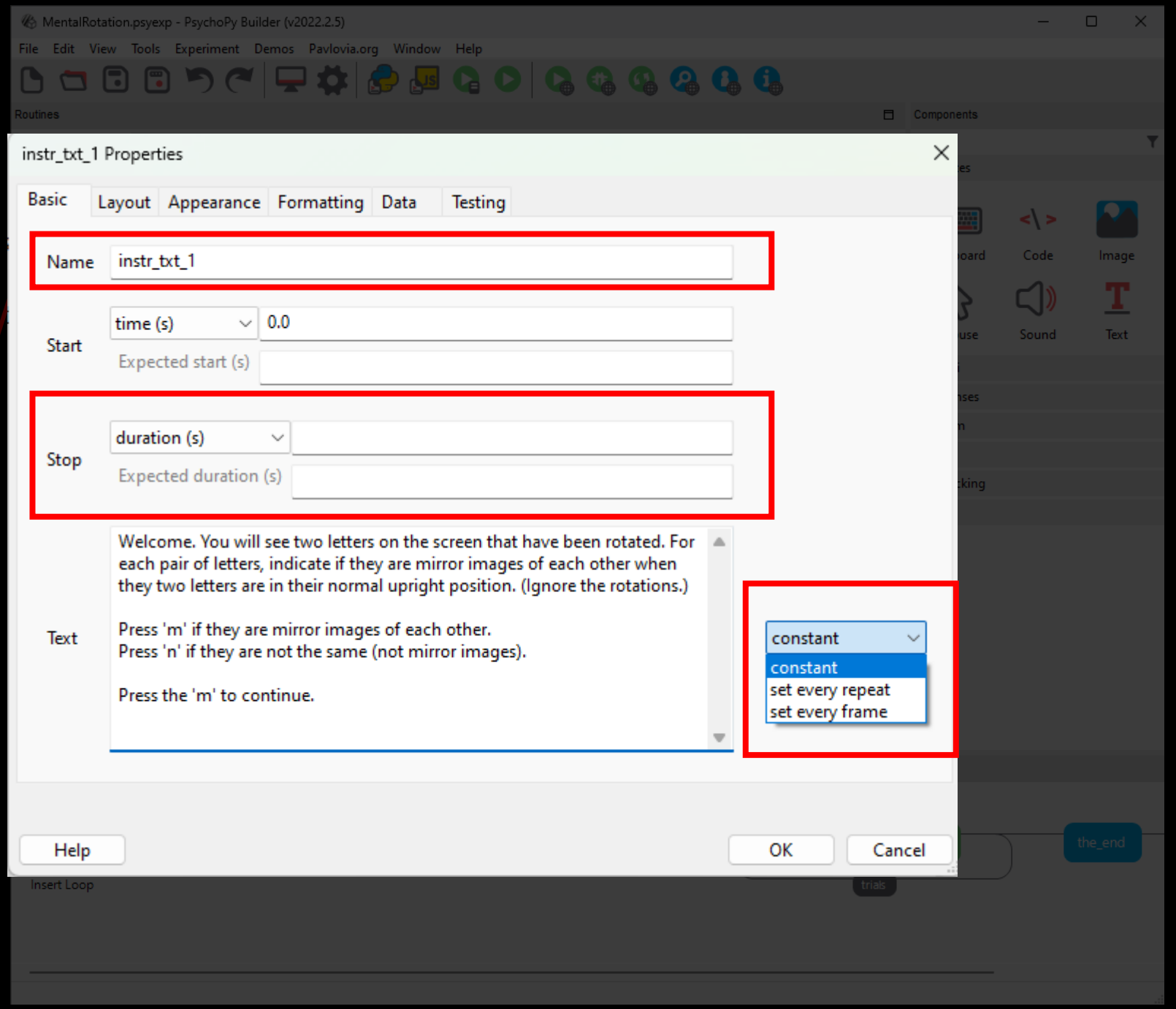




PsychoPy Builder

Component properties

Components



Cod

DON'T PANIC

MentalRotation.psyexp - PsychoPy Builder (v2022.2.5)

File Edit View Tools Experiment Demos Pavlovia.org Window Help

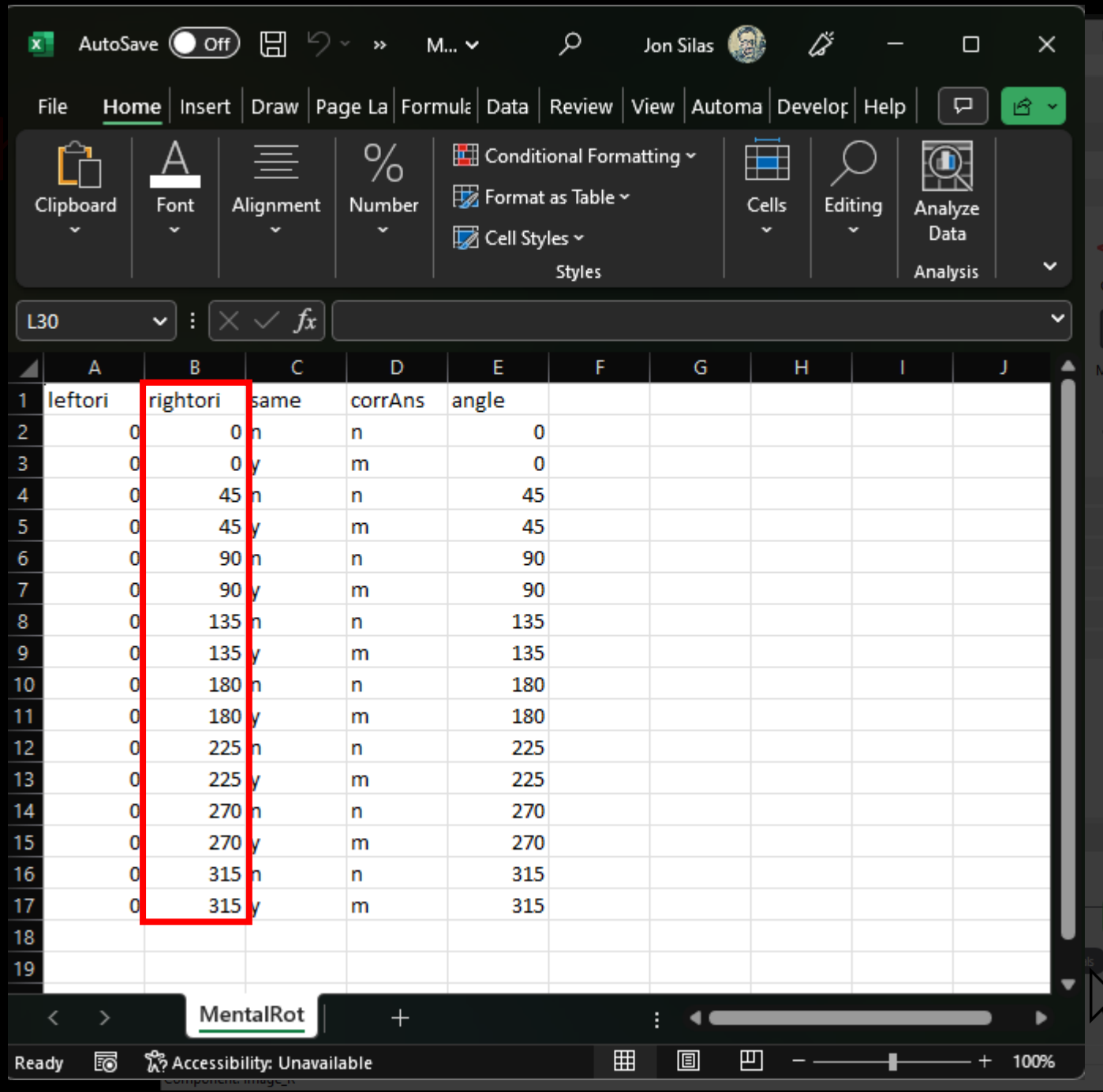
check_end Properties

Name check_end Code Type Py disabled

Before Experiment | Begin Experiment | Begin Routine * | Each Frame | End Routine | End Experiment

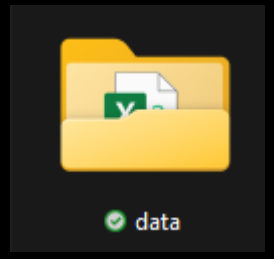
```
1  # this allows us to end the current task on the nth trial if the participant name was pilot
2  if trials.thisN == 4 and expInfo['participant'] == 'pilot':
3      trials.finished = True
```

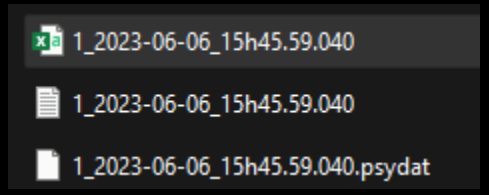
Help OK Cancel



	A	B	C	D	E
1	leftori	rightori	same	corrAns	angle
2	0	0	n	n	0
3	0	0	y	m	0
4	0	45	n	n	45
5	0	45	y	m	45
6	0	90	n	n	90
7	0	90	y	m	90
8	0	135	n	n	135
9	0	135	y	m	135
10	0	180	n	n	180
11	0	180	y	m	180
12	0	225	n	n	225
13	0	225	y	m	225
14	0	270	n	n	270
15	0	270	y	m	270
16	0	315	n	n	315
17	0	315	y	m	315
18					
19					

Output files





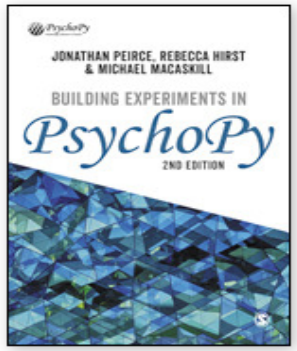
By default, this is how the output file name is constructed:
<participant_ID>_<experiment_name>_<date>_<time>.csv

Getting started with PsychoPy

Download and install standalone package:

https://www.psychopy.org/download.html

Help & support



Building Experiments in PsychoPy

SECOND EDITION

Jonathan Peirce - The University of Nottingham, UK

Rebecca Hirst

Michael MacAskill - The University of Otago, New Zealand Aotearoa

In the library

- PsychoPy Experiment Recipe Book
  - https://workshops.psychopy.org/tutorials/index.html
- Susan Benear's - Coding Outreach Group Summer Workshop – PsychoPy
  - https://tu-coding-outreach-group.github.io/cog_summer_workshops_2021/psychopy/index.html
- PsychoPy Forum – use it, create an account, ask questions and help others.
  - https://discourse.psychopy.org

PsychoPy - citations

- Peirce, J. W., Gray, J. R., Simpson, S., MacAskill, M. R., Höchenberger, R., Sogo, H., Kastman, E., Lindeløv, J. (2019). PsychoPy2: experiments in behavior made easy. *Behavior Research Methods.* 10.3758/s13428-018-01193-y
- Peirce, J. W., Hirst, R. J. & MacAskill, M. R. (2022). Building Experiments in PsychoPy. 2nd Edn London: Sage.
- Peirce J. W. (2009). Generating stimuli for neuroscience using PsychoPy. *Frontiers in Neuroinformatics,* **2** (10), 1-8. doi:10.3389/neuro.11.010.2008
- Peirce, J. W. (2007). PsychoPy - Psychophysics software in Python. *Journal of Neuroscience Methods,* **162** (1-2):8-13 doi:10.1016/j.jneumeth.2006.11.017