IMPLEMENTATION

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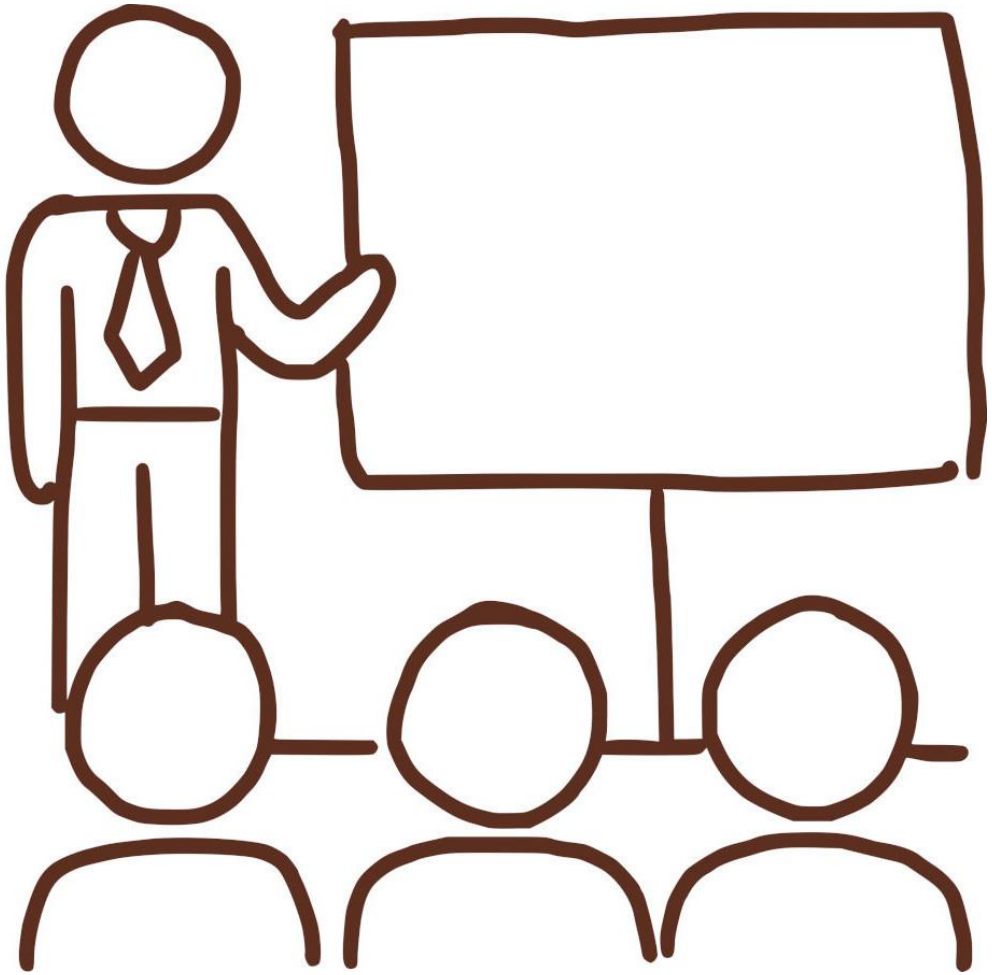
PSAW course, WFAIS UJ

IT'S TIME FOR PRESENTING YOUR EXPERIMENTS (FROM PREV LAB)



HOW TO LAUNCH THESE PROTOCOLS?

A.K.A. REQUIREMENTS

REQUIREMENTS

"Methodological":

- Group assignment (double blind? randomization?)
- Stimuli randomization
- Instructions
- Calibration (for baseline signals)
- Training (not recorded at all)
- …

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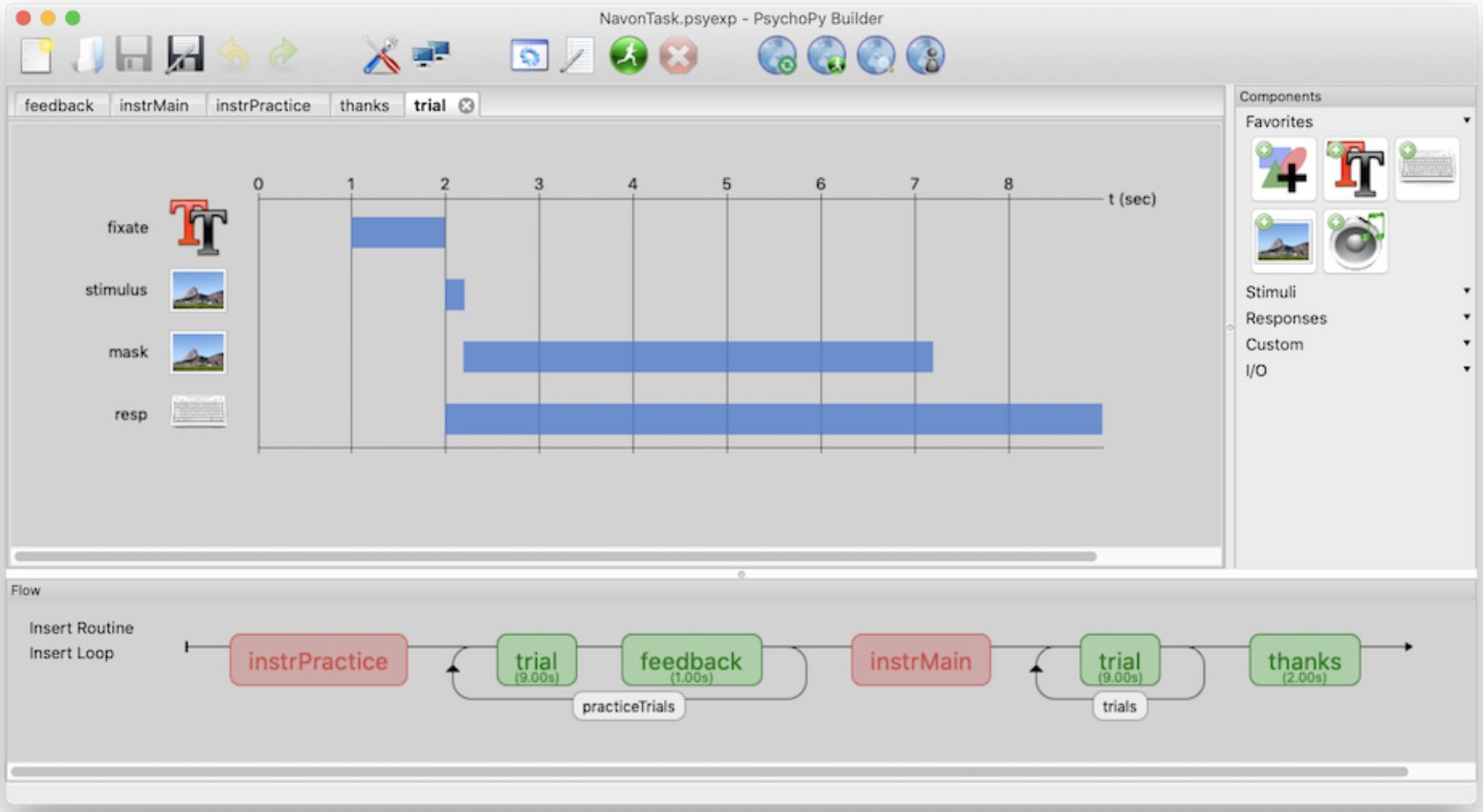
"Technical":

- **Timing** and **Synchronization**
  (more details at the end of the lecture)
- Desktop vs On-line (vs Mobile)?
- Operating system / Web browser?
- …

FRAMEWORKS

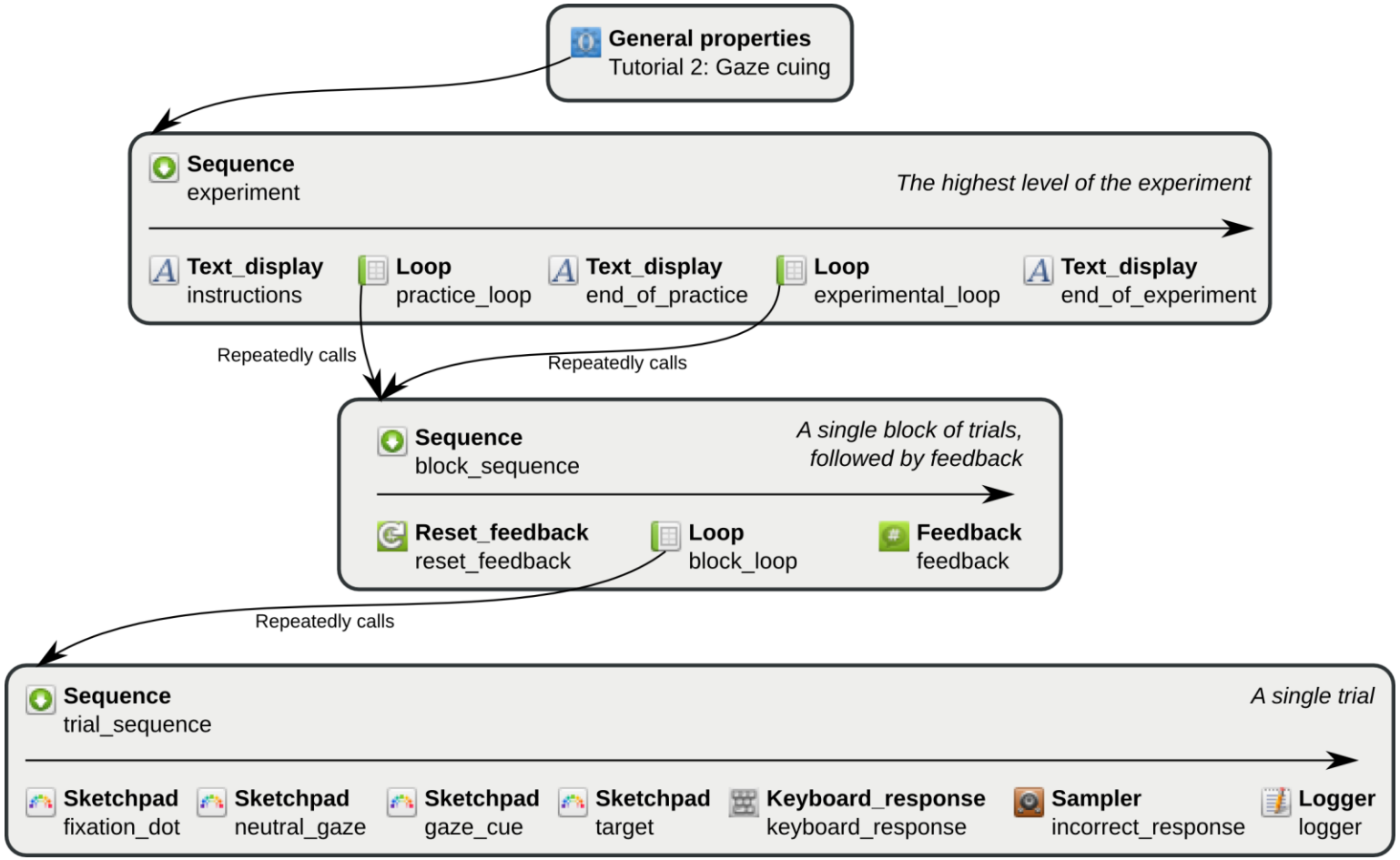
THIS WORK HAS ALREADY BEEN DONE...



PsychoPy

- GUI builder (with Python snippets) & Pure Python
- Cross-platform (Win, Linux, Mac)
- Desktop & On-line

- Free & open source with huge community (and many additional materials)
- Pavlovia.org – shared repository of experiments



OpenSesame

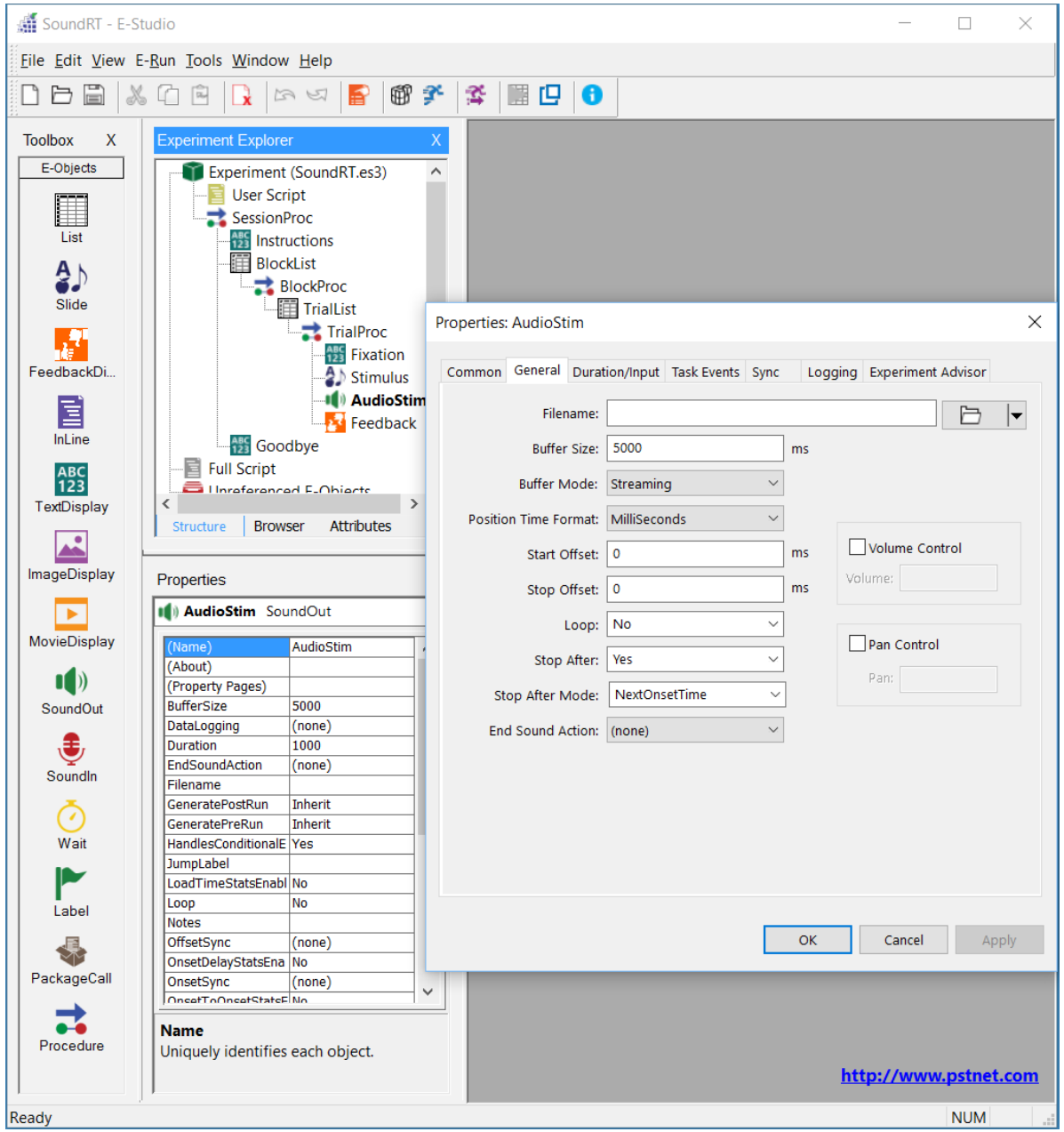
- GUI builder with Python/JS scripts
- Cross-platform (Win, Linux, Mac)
- Desktop & On-line
- Android support (only runtime; click here for docs)

- Free & open source
- Fully reliable GUI-based builder (in opposition to PsychoPy), but there is no possibility to export the whole protocol to pure Python

E-Prime

- Desktop (only Windows)
- GUI builder
- Scripting: E-Basic (Visual Basic dialect)
- Paid

- Support for (almost?) all professional devices (incl. MRI scanners, various sensors, input/output gadgets)



OTHER FRAMEWORKS

- *Expyriment* – free, Win / Linux / Mac / Android
- *Psychtoolbox* – free, cross-platform (for Matlab/Octave & Python)
- *Inquisit* – paid, Windows & on-line
- NBS *Presentation* – paid, Windows & mobile (Android & iOS)
- *Testable* – paid, on-line

- Many JavaScript-based libraries for web experiments (most of them rely on responsive design which simplifies mobile experiments): *PsychoJS* (on-line part of PsychoPy), *jsPsych*, *Lab.js*, . . .

- And more!

TIMING & SYNCHRONIZATION

TIMING & SYNCHRONIZATION

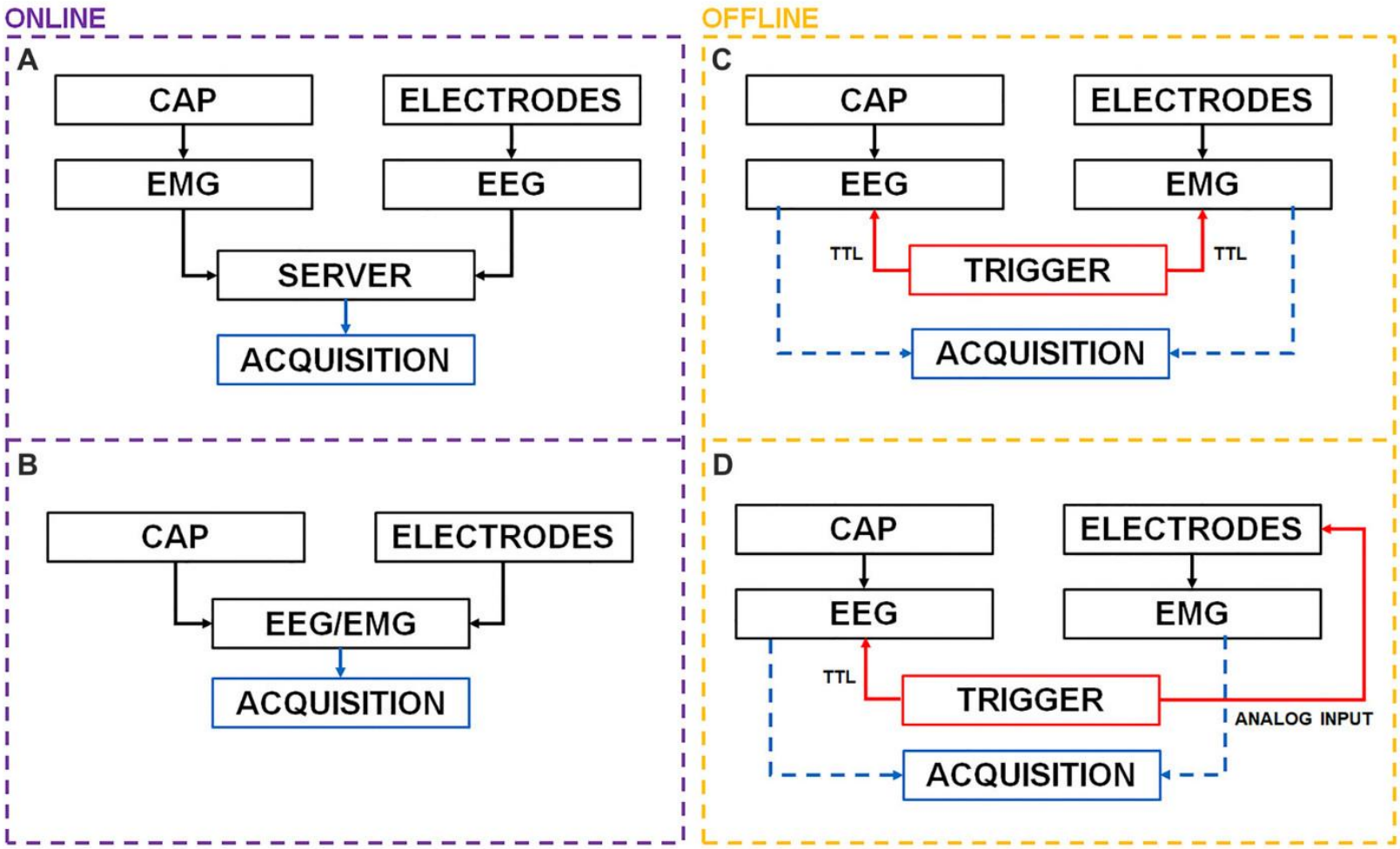
- We need to know ***exactly*** when the stimuli occurred and when the subject responded
- Data streams must be ***accurately synchronized*** to infer about actual underlying physiological mechanisms
- Operating System is very important as ***timing strictly rely on low-level OS time mechanisms***!

Package	Platform	Mean precision (ms)	Reaction times		Visual durations		Visual onset		Audio onset		Audiovisual sync	
			Var (ms)	Lag (ms)	Var (ms)	Lag (ms)	Var (ms)	Lag (ms)	Var (ms)	Lag (ms)	Var (ms)	Lag (ms)
PsychToolBox	Ubuntu	0.18	0.31	12.30	0.15	2.05	0.18	4.53	0.17	−0.74	0.11	−5.27
Presentation	Win10	0.29	0.35	11.48	0.23	−1.83	0.34	7.07	0.31	0.56	0.19	−6.51
PsychToolBox	macOS	0.39	0.44	22.27	0.12	−2.15	0.41	21.52	0.53	0.09	0.43	−21.43
PsychoPy	Ubuntu	0.46	0.31	8.43	1.19	3.49	0.34	4.71	0.31	−0.71	0.16	−5.43
E-Prime	Win10	0.57	0.53	9.27	0.18	2.51	0.18	4.41	0.98	5.08	0.97	0.67
PsychToolBox	Win10	0.67	0.42	10.49	0.75	2.24	0.19	4.56	0.99	0.77	0.98	−3.79
PsychoPy	Win10	1.00	0.35	12.05	2.42	−1.97	0.35	7.10	0.96	0.85	0.93	−6.25
PsychoPy	macOS	2.75	0.40	22.02	11.56	1.00	0.55	18.24	0.70	0.54	0.52	−17.70
Open Sesame	macOS	3.14	0.54	21.21	1.65	18.94	0.79	18.10	6.40	9.46	6.30	−8.64
Open Sesame	Ubuntu	3.41	0.45	9.68	9.16	32.29	0.50	2.35	3.45	2.05	3.48	−0.30
Open Sesame	Win10	4.02	1.22	8.27	1.12	17.04	0.72	3.85	8.56	47.24	8.50	43.39
Expyriment	Win10	6.22	2.90	10.76	0.55	−0.08	0.19	5.98	13.72	106.83	13.72	100.85
Expyriment	Ubuntu	7.75	2.73	23.45	8.31	12.08	0.73	16.75	13.49	118.67	13.50	101.92
Expyriment	macOS	9.05	4.84	33.83	7.04	−1.13	4.82	29.02	13.84	42.81	14.72	13.79

- Desktop software is better than on-line (browser-based)
- The winning OS depends on your procedure (e.g., desktop Linux is precise, but not Linux web browsers)
- The best are: *PsychoPy*, *Psychtoolbox*, *E-Prime* and NBS *Presentation*

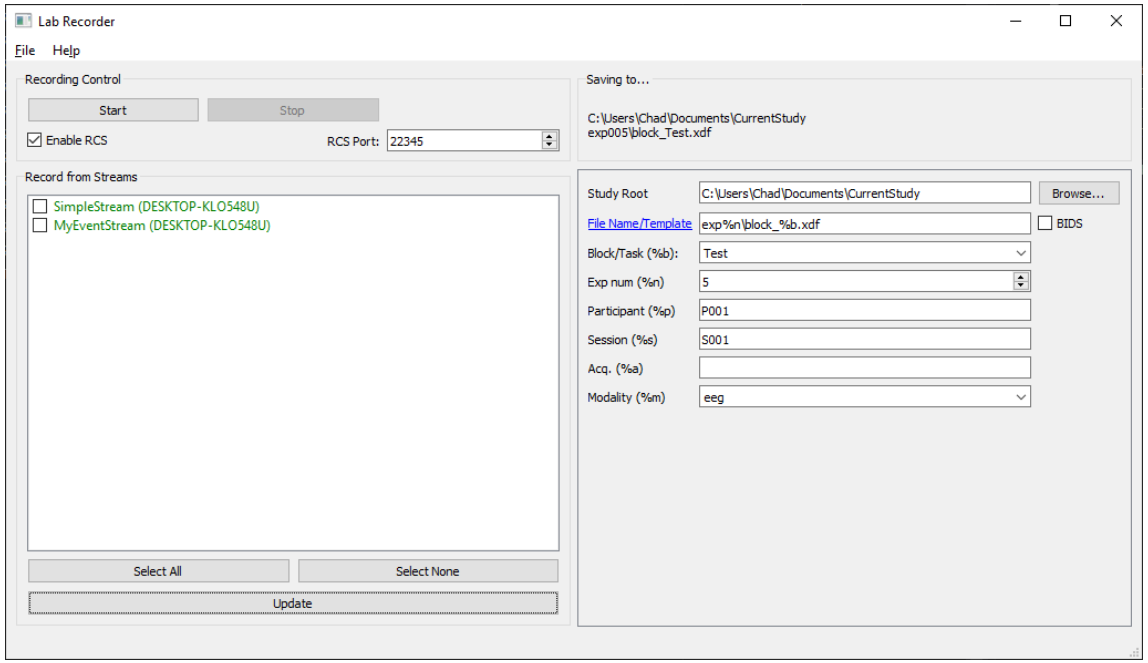
D. Bridges et al. (2020). The timing mega-study: comparing a range of experiment generators, both lab-based and online. *PeerJ 8*:e9414

SYNCHRONIZATION



F. Artoni *et al.* (2018). Effective Synchronization of EEG and EMG for Mobile Brain/Body Imaging in Clinical Settings. *Front. Hum. Neurosci. 11*:652

LAB STREAMING LAYER (LSL)



- Streaming & syncing data streams over local network
- Devices synchronization (over NTP protocol)
- Interfaces for Python, Android, C#, Java, Matlab, Unity
- Many experiment-related tools have support for LSL
- Quite good online documentation with examples: https://labstreaminglayer.org/

LET'S PRACTICE!

STROOP TASK IN PSYCHOPY

STROOP TASK & STROOP EFFECT

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VOL. XVIII, No. 6 DECEMBER, 1935

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1 control	2 compatible	3 incompatible
dog	red	red
chair	yellow	yellow
boat	green	green
window	blue	blue
block	red	red
fan	blue	blue
wheel	yellow	yellow
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	Condition A	Condition B
Stimulus	GREEN	GREEN
Response		
	fast response	*slow* response

KEEP CALM AND ASK QUESTIONS!

GEIST Research Group: https://geist.re/
Krzysztof Kutt: https://krzysztof.kutt.pl/