Online Testing: What's Available and How to Use It Effectively

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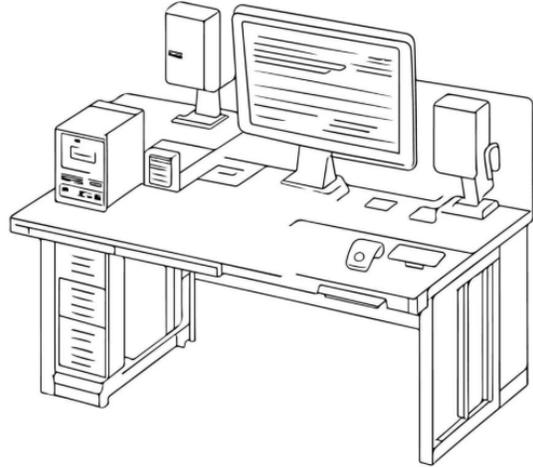
Summary

1. Background to online testing
2. Which online methods do we support at the CBU?
3. Steps required to run a online experiment at the CBU.
4. Resources and support.
5. Common issues and solutions.
6. Live coding session.

What's the difference online

In Lab

- Same hardware/software for all
- Less variables in the setup
- Lots of software options (Matlab, E-prime, presentation)

ONLINE

- Different devices (PC, mac, tablet, phone)
- Different software/ browsers
- HTML/CSS/Javascript

There are 2 device locations

- There will be a participant device (their computer) and a researcher DEVICE (in this case our JATOS server at the CBU)
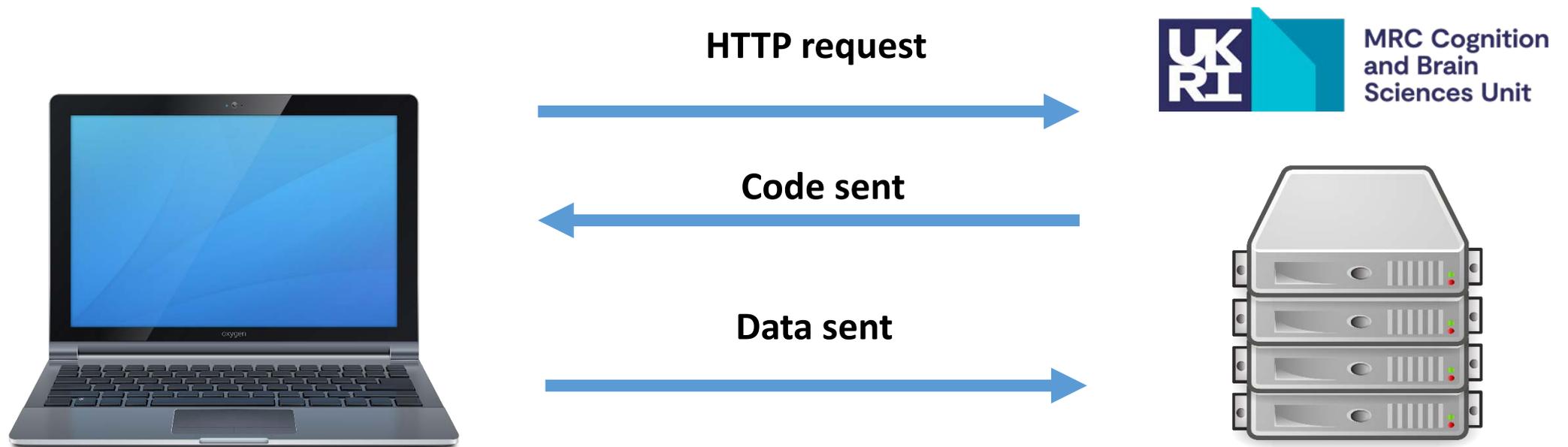
Why Online?

1. Reduces the time recruiting and testing participants

2. Global reach (Prolific, MTurk, SONA)

3. Recruit specific samples across the world
   - E.g. high music proficiency, specific clinical

4. Drawbacks are being mitigated
   - Reaction times, headphone checks, attention checks, performance bonuses

5. Lab based results are being replicated

Replication

In-Person	Online replication
N=30	N=99
Data collection in 1 month	Data collection in 48 hours
Professional headphones in lab	Headphones (verified) on home computer

This example is a categorical learning and decision making task (auditory and visual stimuli) in Gorilla .

Roark, Paulon, Sarkar, & Chandrasekaran (2021). Psych. Bull & Review
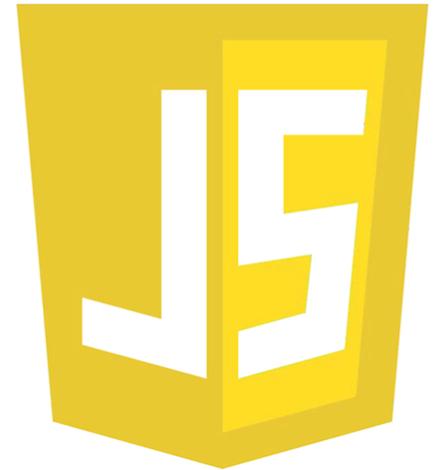
Building blocks

Structural Content

Style

Interactive, dynamic Content

HTML basics

```
<!DOCTYPE html>
<html>
<body>
|


</body>
</html>
```

Specifies HTML5 language

Root element

Content

Headings


```
<!DOCTYPE html>
<html>
<body>

<h1>This is heading 1</h1>
<h2>This is heading 2</h2>
<h3>This is heading 3</h3>
<h4>This is heading 4</h4>
<h5>This is heading 5</h5>
<h6>This is heading 6</h6>
<p>This is a paragraph</p>

</body>
</html>
```

> opens

</ Closes

This is heading 1

This is heading 2

This is heading 3

This is heading 4

This is heading 5

This is heading 6

This is a paragraph

Images

```
<!DOCTYPE html>
<html>
<body>


<h2>How to insert HTML Images</h2>
<p>HTML images are defined with the img tag:</p>


<img src="w3schools.jpg" alt="W3Schools.com"
width="104" height="142">


</body>
</html>
```

How to insert HTML Images

HTML images are defined with the img tag:

- **src** = path to the image
- **alt** = description of the image
- **width** and **height** in **pixels**

CSS

- In HTML, you can add **CSS styles** in three different ways
    1. Inline (inside the html element)
    2. You add styles inside the <style> tag within the <head> section.
    3. You create a separate **CSS file**

CSS

```html
<!DOCTYPE html>
<html>
<head>
    <style>
        body {
            background-color: lightblue;
        }
        h1 {
            color: blue;
            font-size: 30px;
        }
        img {
            border: 2px solid black;
        }
    </style>
</head>
<body>

<h1>Define the css style</h1>
<img src="w3schools.jpg" alt="W3Schools.com"
width="104" height="142">

</body>
</html>
```
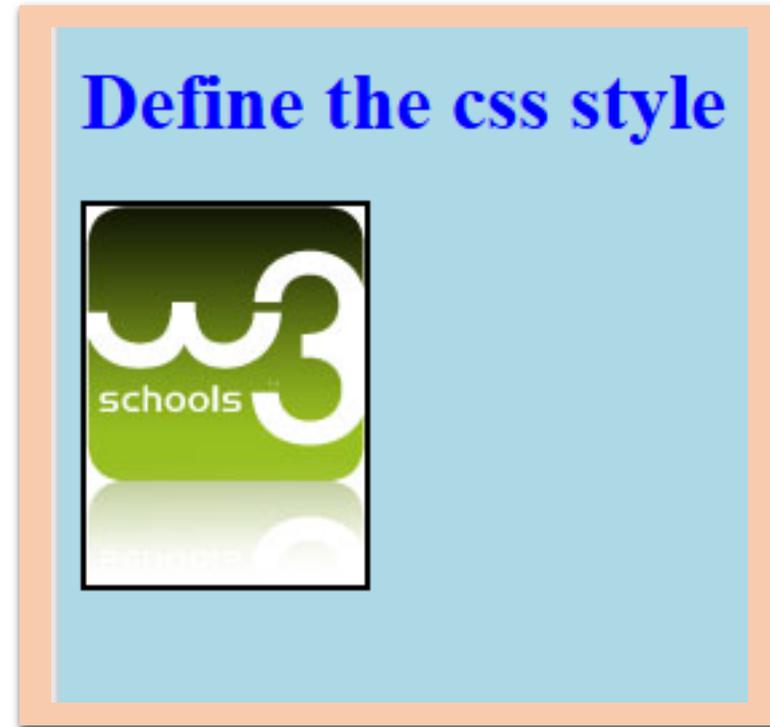
Define the css style


```html
<!DOCTYPE html>
<html>
<body>
<h1 style="color: blue; font-size: 30px;">This is heading 1</h1>
</body>
</html>
```

JavaScript

```html
<!DOCTYPE html>
<html>
<head>
    <style>
        body {
            background-color: lightgray;
        }
        h1 {
            color: blue;
            font-size: 30px;
        }
        img {
            border: 2px solid black;
        }
    </style>
</head>
<body>
<h1>This is heading 1</h1>
<img src="w3schools.jpg" alt="W3Schools.com" width="104" height="142">
<script>
document
.querySelector('img')
.addEventListener('click',
function(e){

    e.target.remove();
});
</script>
</body>
</html>
```
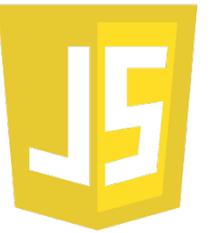
```html
<script>
document
.querySelector('img')
.addEventListener('click',
function(e){

    e.target.remove();
});
</script>
```

Toolboxes and online testing software

jspsych

PsychoPy

JATOS

Prolific

GORILLA

Lab.js

Pavlovia

amazon mechanical turk

Toolboxes and online testing software

PsychoPy

jspsych

GORILLA

Lab.js

Toolboxes and online testing software

GORILLA

JATOS

Lab.js

Pavlovia

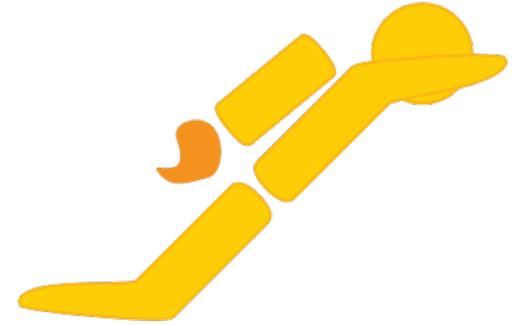# Toolboxes and online testing software

What we support at the CBU

- **JATOS, Gorilla**, *Pavlovia* (*PsychoPy)*
  - *Cognitive behavioural experiments*
  - jsPsych
- ***Qualtrics*** for surveys
- REDCap for data bases

JATOS

- JATOS is **free** and **open source**
  - Already set up on the **CBU server**.
- JavaScipt/HTML/CSS.
  - HTML/CSS
    - Building block in creating a webpage and the styling
  - JavaScript
    - Language that is most commonly used to generate dynamic content on the web
  - jsPsych
    - Toolbox of JavaScript commands
- Supports jsPsych, OpenSesame, lab.js code
- Easy to link to online participant pools
  - Prolific, MTurk, plus others.
- Advantages
  - Supported by me

```html
<!doctype html>
<html>
<head>
    <meta name = "viewport" content = "maximum-scale=1">
    <title>End</title>
    <script src = "/study_assets/cattell_camcan/jquery.min.js" type="text/javascript"></script>
    <script src = "/study_assets/cattell_camcan/jsPsych-master/jspsych.js" type="text/javascript"></script>
    <script src = "/study_assets/cattell_camcan/jsPsych-master/plugins/jspsych-survey-text-autofocus.js" type="text/javascript"></script>
    <!-- <script src = "/study_assets/cattell_camcan/jsPsych-master/plugins/jspsych-instructions.js" type="text/javascript"></script> -->
    <link rel="stylesheet" type="text/css" href="/study_assets/cattell_camcan/jsPsych-master/css/jspsych.css">
    <style type="text/css">.jspsych-content {width: 80%; text-align: left;} .jspsych-btn {min-width: 120px; min-height: 50px; font-size: inherit;} textarea {font-size: 16px;}</style>
    <script src="/assets/javascripts/jatos.js"></script>
</head>
<body>
</body>

<script type="text/javascript">
$(function() {
jatos.onLoad(function() {

    jsPsych.data.addProperties({
        jatos_study_ID: jatos.studyId,
        jatos_component_ID: jatos.componentId,
        jatos_component_result_ID: jatos.componentResultId,
        jatos_worker_ID: jatos.workerId,
        jatos_study_result_ID: jatos.studyResultId,
        task_version: "camcanrescan"
    });

    // get the custom study ID from session data, if it exists
    var valid_id = false;
    if (jatos.studySessionData.cam_id) {
        valid_id = true;
        var cam_id = jatos.studySessionData.cam_id;
        jsPsych.data.addProperties({cam_ID: cam_id});
        // create the redirect URL to let php server know that this participant has completed the study
        // var root_url = "https://camcan-rescan.mrc-cbu.cam.ac.uk/task-list?completedtaskid=2";
        // var redirect_url = root_url.concat("id=" + cam_id + "&taskid=2");
    }

    var debrief_questions = {
        type: 'survey-text-autofocus',
        preamble: '<p>Thanks, you&#39;re done with that task!</p><p>The questions below are optional. However, we appreciate any information you can provide.</p>',
        questions: ["Did you experience any technical problems?", "Do you have any other comments about your experience doing the study?<br>For instance, did you have any problems paying attention or understanding how to do the tasks?"],
        rows: [5,5],
        columns: [80,80],
        button_label: 'Finish'
    };

    timeline = [debrief_questions];
```
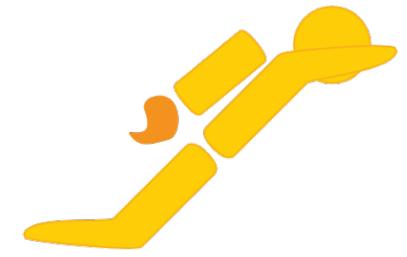
- Drag and drop experiment builder

- CBU has a licence

- Suited to people with less coding experience in JavaScript
  - Easy to make an aesthetic experiment
  - Some capacity to add more complex JavaScript/Html
  - Can set up trial order in a .csv which can be uploaded Gorilla

- Data hosted externally
  - ISO27001 servers, Penetration tested

A)

Flanker

⚙ Settings | ⚑ Preview Task

You are currently creating version 4

↺ Version History | ✖ Cancel Changes | ☁ Commit Version 4

| Task Structure | Spreadsheet | Stimuli | Manipulations | Script |

Practice_Trials: Screen 2

Instructions

Screen 1 | Screen 2 | Screen 3 | Scr

Practice_Trials

Screen 1 | Screen 2

Instructions_Start

Screen Layout

Show Zone Names

Edit Layout | Copy Layout

Press _F_ for Left   ### Press _M_ for Right

Distrac | Distrac | Target | Distrac | Distractor

Configuration Settings

Image

Hide after [setting] ms

B)

You are currently creating version 2

↺ Version History | ✖ Cancel Changes | ☁ Commit Version 2

➕ Add New Node | ... | ⚑ Check For Errors

Start
All Groups
start

iframe_check
Task
task-w3nn

Randomiser
balanced
randomiser-swt

Flanker (v3)
Task
task-0word

Flanker (v3)
Task
task-4e0l0

Finish
Include
https://app.prolific.ac
finish

Which to choose

JATOS
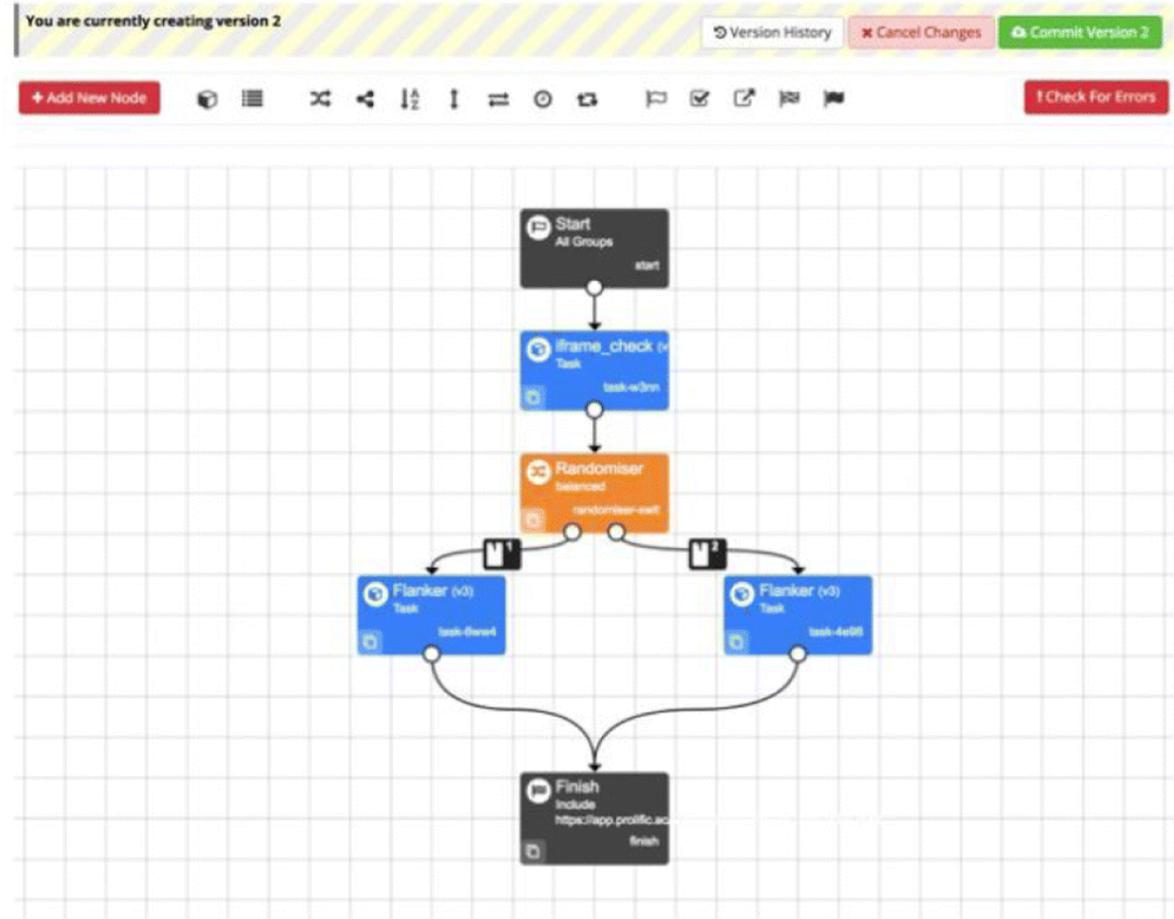
Pros

- **Free and Open Source**
- **Advanced Customization**
- **Local Server Hosting**
- **Collaborative Tools**
- **Flexible Data Collection**
- **Scalable for Advanced Users**

Cons

- **Steep Learning**
- **Less Beginner-Friendly**
  - **Lacks a graphical interface**
- **Limited Built-In Support**

GORILLA™

Pros

- **User-Friendly Interface**
- **Version control**
- **Pre-Built Tools and Templates**
- **Integrated Hosting and Participant Recruitment**
- **Simpler data output as .csv**
- **Customer Support and Documentation**
- **Robust Design for Beginners**

Cons

- **Subscription Costs**
- **Limited Customization**
- **Dependency on Platform**

Feature	Gorilla	JATOS (with jsPsych)
Cost	Paid subscription	Free and open-source
Ease of Use	Beginner-friendly	Steep learning curve
Customization	Limited	Extensive, via coding
Data Handling	Automatic organization	Customizable, manual setup
Data export	Automatically as .csv	JSON .txt as standard
Technical Expertise	Minimal required	High (JavaScript)
Support	Dedicated support, documentation	Community forums, documentation, A. Attaheri
Ideal Use Case	Standardized tasks, fast setup	Advanced, niche experiments

Where to start

- Intranet;
  - https://intranet.mrc-cbu.cam.ac.uk/home/web-resources/
  - Adam.Attaheri@mrc-cbu.cam.ac.uk
- See if the experiment already exists at the CBU
  - Email me or talk to colleges
- Install local JATOS or Gorilla
- Web Experiment Management Committee
  - CBU scientists engaged in online testing who advise on technology, methodology, and ethics
  - Admin and IT staff that coordinate access to CBU resources (JATOS server, Prolific fund transfers etc)
  - Information on the intranet here: https://intranet.mrc-cbu.cam.ac.uk/home/wemc/

What you need for approval

- WEMC application and PPM presentations may be needed depending on cost:
  - <£100 – CBU PLs can request funds for pilot data collection
  - £100 to £1000 – submit a WEMC form to describe your study
  - >£1000 – submit a WEMC form and give a PPM presentation
- Forms for online studies:
  - Study request form: https://intranet.mrc-cbu.cam.ac.uk/wp-content/uploads/2017/05/WEMC_Form_2.10_July_2024.docx
  - Additional testing form: https://intranet.mrc-cbu.cam.ac.uk/wp-content/uploads/2017/05/WEMC_Additional_Testing_1.2-1.docx

Resources; don't reinvent the wheel

- Developing a CBU repository of tasks
  - Work in progress!
- CamCAN
  - Cattell (fluid intelligence), Spot the word, Reaction time task, Digit-Symbol Substitution Task, Word meaning task.
  - Normed data
- JATOS/jsPsych example studies
  - Lexical decision making, Visual psychophysics, Attentional capture, Arcade games (Phaser, HTML5, WebGL), Mouse tracking, Change blindness, Audio recording, Video recording (using participants webcam), Deary-Liewald task.

No need to reinvent the wheel

Journal of Memory and Language
Volume 134, February 2024, 104472

Moving experimental psychology online: How to obtain high quality data when we can't see our participants

Jennifer M. Rodd ✉

- Online tutorials
  - JATOS
  - JsPsych
  - Gorilla
- Conference
  - BEONLINE meeting
  - https://beonlineconference.com/
  - **Jennifer Rodd;** https://doi.org/10.1016/j.jml.2023.104472
  - **Alexander Anwyl-Irvine;** https://doi.org/10.3758/s13428-020-01501-5
  - **Adam Attaheri;** https://www.mrc-cbu.cam.ac.uk/events/methods-day/
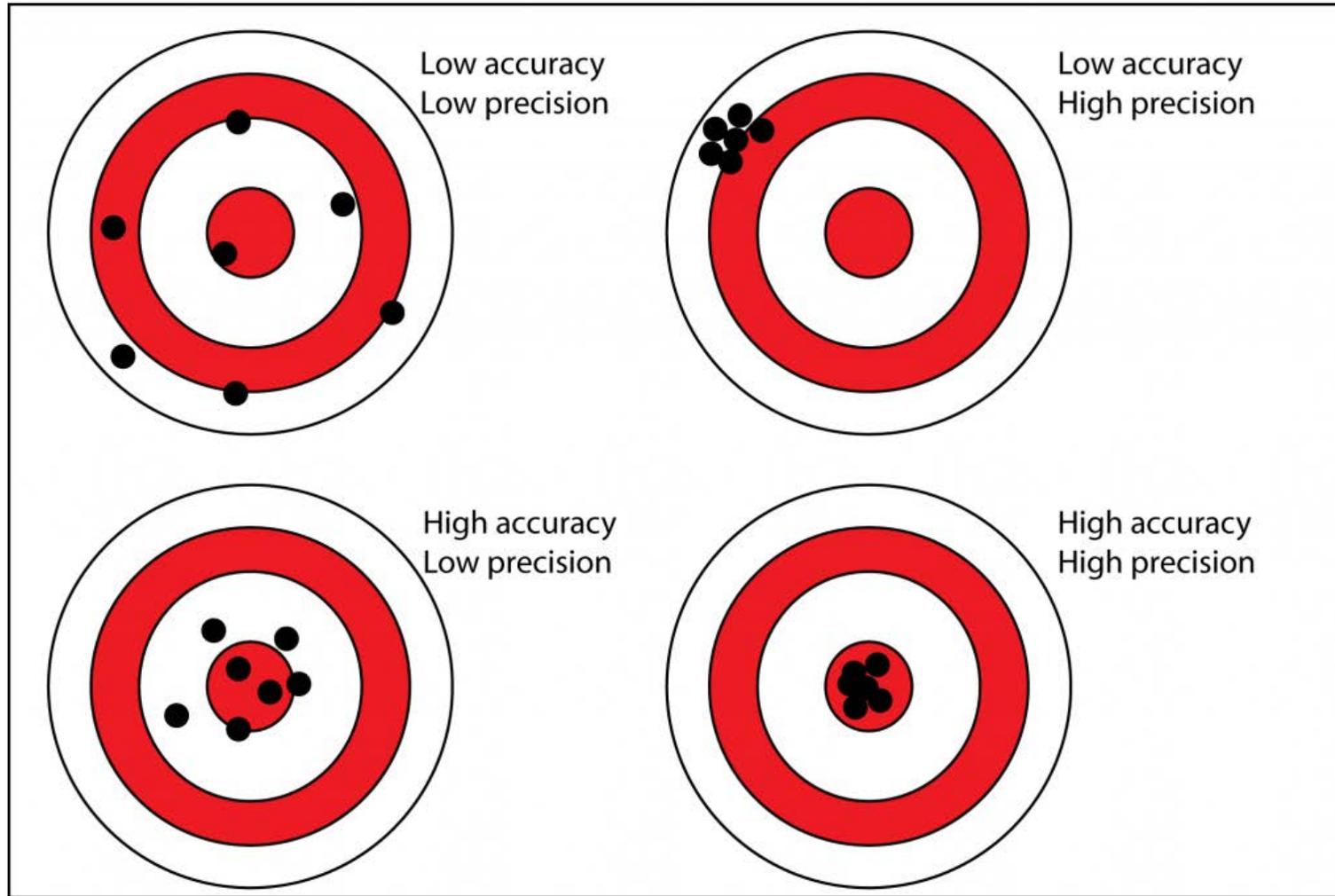- Talk to colleagues
  - CamCAN

Standing on the shoulders of CBU giants

- Lidea Shahidi – Carlyon group - Synthetic speech listening - AUDITO Audito
- Estela Carmona Gonzalez – Manly Lab – Gorilla - The influence of self-relevant information – Keyboard input
- Emily Bagley – Nord lab – JsPsych – stickiness of disgust- Video rating
- Sara Mehrhof - Nord lab – jsPsych, Phaser, JATOS - effort-based decision-making
- Georgia Bozianu- Lambon-Ralph lab- VS Code, JATOS - Normative Reaction Times in Non-Semantic Decision-Making - Reaction Time
- Gina Humphreys - Lambon Ralph lab - Gorilla - understanding narratives and comic book strips – self-paced reading time (MRI Polit)
- Sammy Weiss-Cowie – Davis lab – jsPsych, Google Cloud Text-to-Speech. Via JATOS – Audio presentation - Stimulus Validation for MEG
- Lucie Debaig – Carlyon lab - Gorilla – listening to vocoded speech - Speech comprehension
- Ketaki Sengupta – Anderson Lab - Gorilla - Intrusive memories – Questionnaire, Think No-Think (TNT) task
- Thu Ngan Dang – Carlyon Lab –jsPsych, Phaser, JATOS - DINBack test- Digits-in-noise audio presentation
- Amira Skeggs – Orben Lab – ZOOM, MIRO, Slack - Large Language Models and Young People's Social Media Experiences – survey
- Hannah Rapaport – Woolgar group- Pavlovia, Psycopy – picture vocabulary test – staircase procedure
- Danny Mitchel – CamCAN- Visual Short-Term Memory Task
- Tom Hartley – CamCAN - Spatial Memory Task
- Alexa Morcom – CamCAN - Visual Long Term Memory task-Term Memory Task
- Matt Davis - CamCAN - Listen-Up Task
- Lucy McGregor – CamCAN - Word Meaning Definitions Task
- Noham Wolpe – CamCAN - Predictive Inference Task Predictive Inference Task

Common issues and solutions

- JATOS experiment size limit is 2GB
- Participant drop out
  - Treat your participants fairly
  - Avoid monotony where possible
  - Breaks and stimulus change significantly increase continued engagement
  - £6 prolific minimum, however, suggested £9.00 hour
- Passing information across repeat visits or platforms
  - Or from prolific to experiment
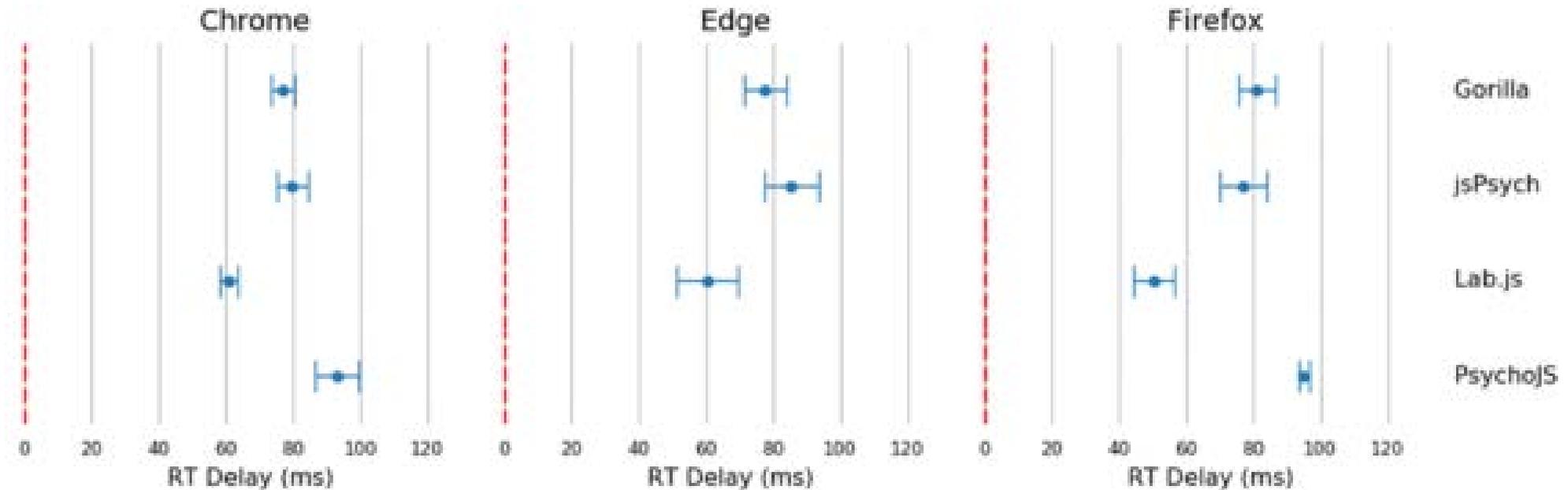 - Imbed in the URL or use session data
- Timing worries

Timing worries

Source = https://www.antarcticglaciers.org/glacial-geology/dating-glacial-sediments-2/precision-and-accuracy-glacial-geology/

Timing worries (reaction rimes)

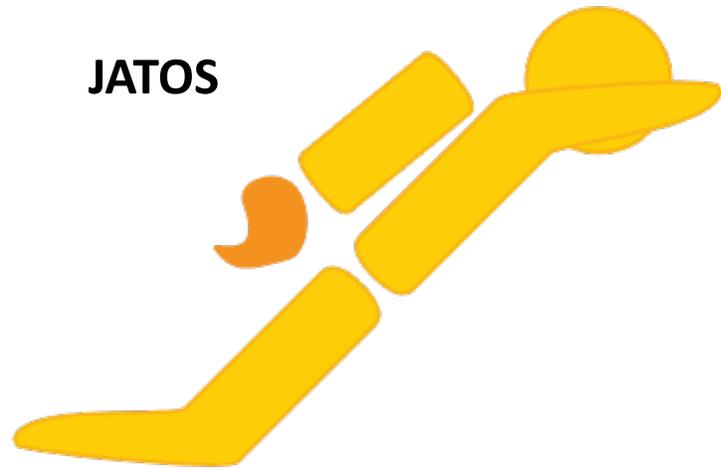|	Mean RT (across OS/device/platform)	STD across
Gorilla	80 ms of delay	8.25 ms
jsPsych	70 ms of delay	15.27 ms

Windows desktop

Alexander Anwyl-Irvine et al., 2021. *Behav Res.*

- Good enough for over 100ms
- performance.now() offers microsecond-precision timestamps. (All main browsers)
- Browser checks in code to reject participants
  - Check browser variability in results

Building a JATOS/jsPsych experiment

JATOS

jspsych

Sublime Text

JATOS = https://github.com/JATOS/JATOS/releases/tag/v3.7.6

JATOS loader = http://127.0.0.1:9000/jatos/login

Username = admin, PW = admin

jsPsych = https://github.com/jspsych/jsPsych

Sublime text = https://www.sublimetext.com/download

CBU intranet = https://intranet.mrc-cbu.cam.ac.uk/home/web-resources/

Live coding demonstration note

- The following slides are just my notes for doing the live demonstration.
- However, I have left them in here as they may be of use to you if you wish to attempt to try the demonstration out for yourself.

Over view of what to do in the live demonstration

- Open up Jatos and make a new experiment
  - This will then create a folder in the root directory
  - Only make this so that you have a root directory to move all the jsPsych stuff into
  - Explain briefly what is in each folder in the jsPsych folder
    - E.g. plugins
- Open up sublime
  - Create a blank html, save it as experiment.html
- Go back to JATOS and create a new component
  - Add in your experiment to this component
- Line by line construct a basic experiment

Live experiment step by step

1. Doctype tells the web browser what type of document it is viewing
   1. <> ,i.e. angle brackets, is the standard html syntax
2. Next is the standard html tags
   1. Within there is the two standard sections to head and the body
3. Within the head is where we load the files that we will need to use in the rest of our code
   1. In HTML, the title tag (<title>) defines the title of a document. It appears in the browser's title bar and in search engine result
4. First we need to load the jsPsych plugins that we are going to use
   1. This has a <script tag which references an external javascript code
   2. Src atribute gives the location of the script
   3. This is a collection of JavaScript that has been made into a function by the people at jsPsych to easily achieve a goal
      1. html-keyboard response
5. Finally in the head will be the css file that controls the style
   1. Jspscyh comes with a ready made one that is good for online experiment
   2. The .css is loaded by a different tag called link with a different attribute called href to define the location
   3. "stylesheet" means this is a CSS file used for styling the page.

Live experiment what to do

6. Next we need to write some java script that will be the body of the experiment
   - We will need another script tag after the body
   - We need to create a **object**. This is a programming variable that contains keys and values.
   - Var is the keyword
   - Welcome_trial is just the variable name
   - And curly bracket is the way that you declare a object
   - We need to tell the jsPysch that we want to use the html_keybord_response plugin as the thing to present the stimulus
   - Each plugin has parameters that you can adjust **(open the actual .js script here)**
   - One of which is the stimulus. In this simple example I am just going to use one of the parameters of the plugin to present text.

Live experiment what to do

7. Finally we need to run the experiment
   - We have to use the function jsPsych.init
     - jsPsych.init was replaced with initJsPsych (and jsPsych.run) in v7+.
   - We need to give jsPsych some options to perform the function
   - First we need to tell jsPsych the order in which we want to run the trials
     - Because we could have set up several trials
   - This is done in the timeline (we need to make a list or array)
   - To make an array in java script you need to use the square brackets
8. That is the basic jsPsych experiment that can be ran in a browser

Live experiment what to do

9. As well as doing the things that make up the experiment, plugins also save data
    - So I'm going to add in another option to the initialisation of jsPsych
    - Called on_finish : and this tells jsPsych what to do when the experiment finishes
    - It will be a function, followed by a list of statements that we want the function to execute
    - So remember curly braces can declare an object or declare a function
    - Here we are going to use the helper function jsPsych.data.displayData()

10. Add in a second trial
    10. Image_button_response
    11. Explain that you are using the image from the built-in examples in jsPsych

11. Add in jsPsych.data.addProperties({participant_id: "Adam"});
    10. Allows you to add custom metadata (properties) to all the trial data collected during an experiment.

Live experiment what to do

11. The final stage is to make it in JATOS
12. To do this add in the,
    11. <script src="jatos.js"></script> in head
    12. jatos.onLoad(function() {
    13. Just below the <script>
    14. Close it with }); just above the ending </script>
13. Add in the //jatos.submitResultData(result_json, jatos.startNextComponent); to submit the data to JATOS
14. Add in JATOS code to the add properties to the data file
    11. jsPsych.data.addProperties({
    12. jatos_study_ID: jatos.studyId,
    13. jatos_component_ID: jatos.componentId,
15. Show how it could be a new component in JATOS
16. Show result file saved in JATOS
    11. Export the json and look at it
17. Make a link
    11. Open link in a separate incognito browser

Live experiment what to do

18. Talk about other plugins and examples in the jsPsych folder
    - Demo-simple-rt-task
        - Using jsPsych-serial-reaction-time
    - 1) Demo it in html (chrome)
    - 2) Add it to your example script

Thank you for listening

HTML5

JS

CSS3

JATOS

jspsych
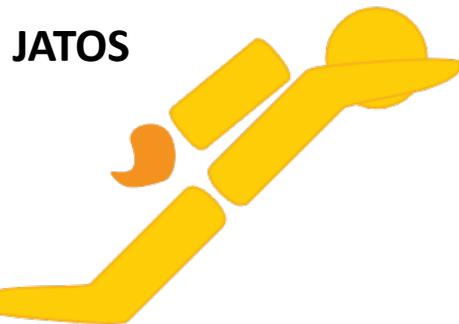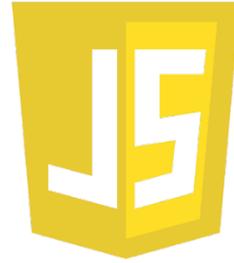
Any Questions?

Contact me on

Adam.Attaheri@mrc-cbu.cam.ac.uk

GORILLA™

qualtrics XM