Cognition Lab

Mental Rotation

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Objectives of this class

In this class you will learn about;

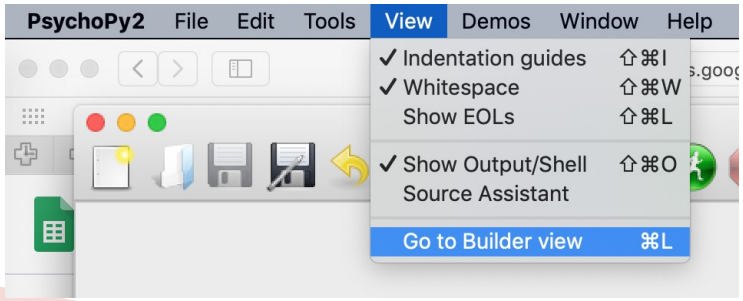
- →The key components of an experiment in PsychoPy's Builder view
- →Mental Rotation study of short-term memory
- →How to write an Introduction

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PsychoPy basics

There are two PsychoPy ways to create experiments in PsychoPy;

- →you can write scripts in the *Coder* view that control the presentation of your stimuli. During the first three labs we opened .py files in *Coder* view
- →you can create an experiment visually in *Builder* view and use that either to run the experiment or to generate a script that you can then modify in *Coder*
- →Today we will mostly look at *Builder* view; if necessary, open that view in your version of PsychoPy

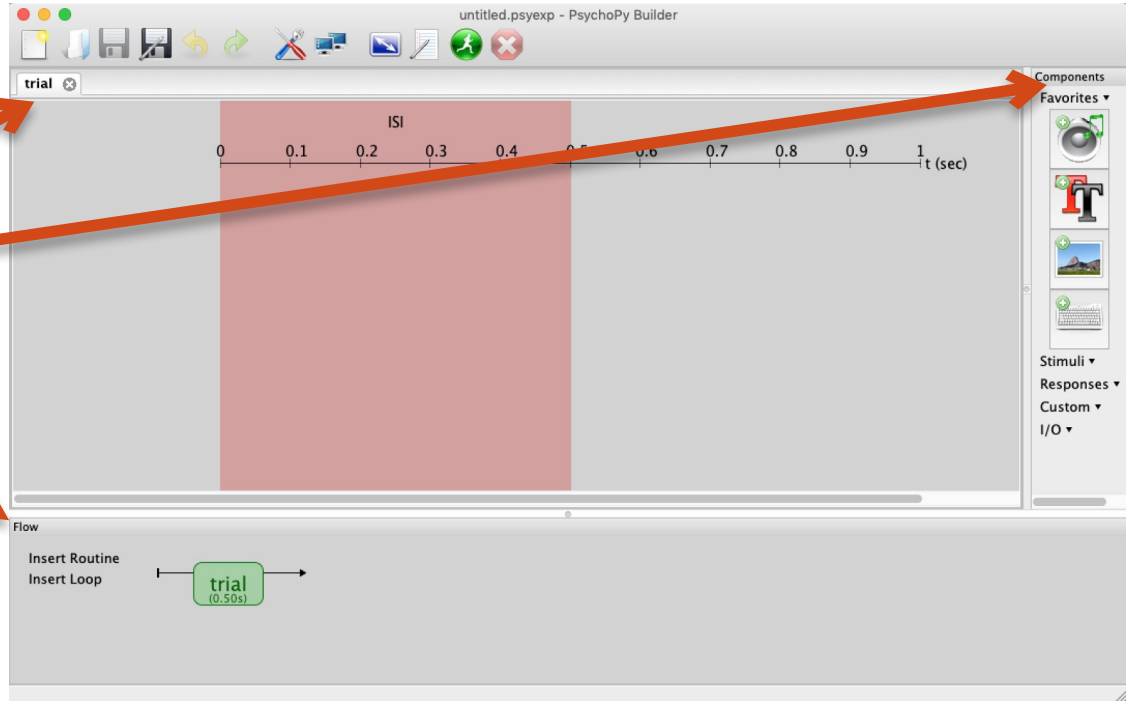


PsychoPy *Builder*

The builder view shows how an experiment runs.

It has *Components* that make up *Routines* that are combined in a *Flow*

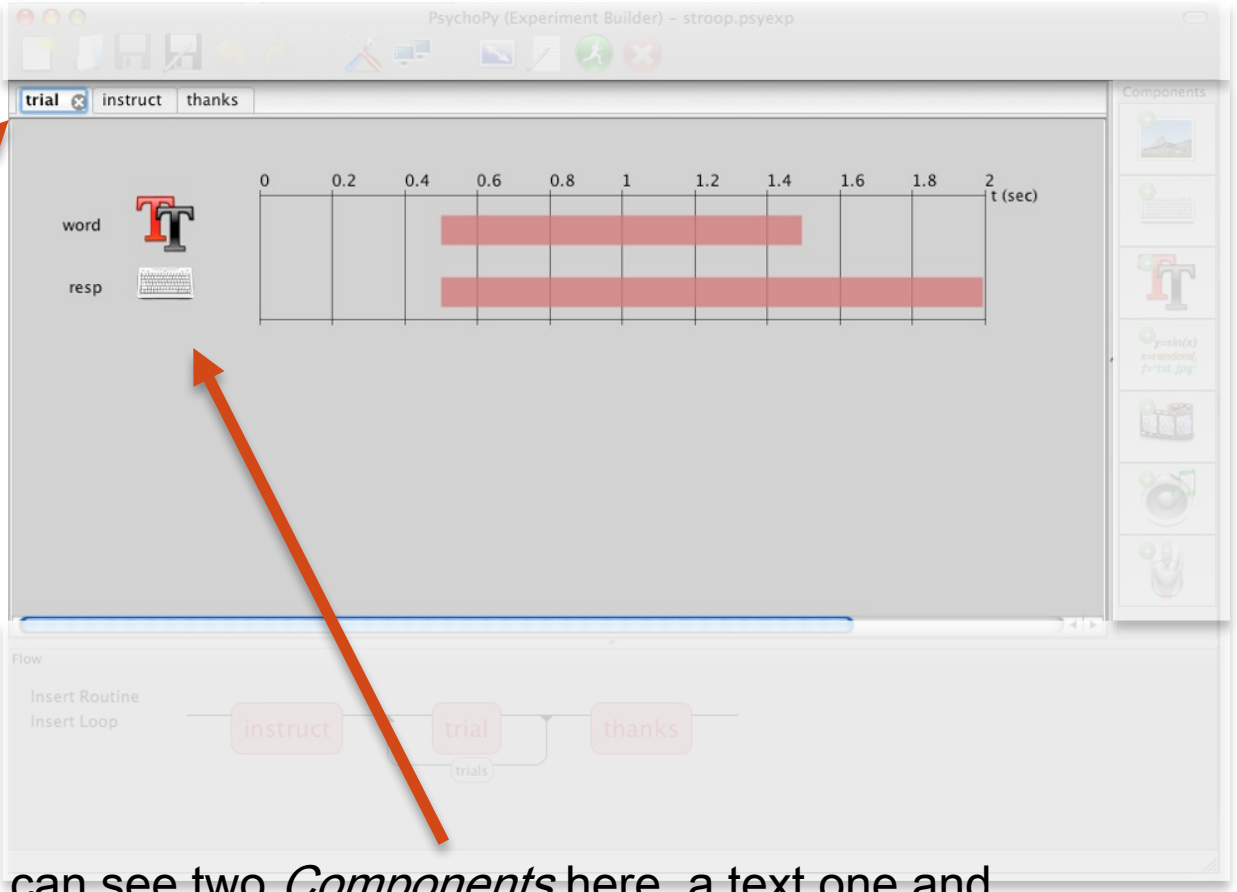
Once you select a Component at the very right of the window, it will appear in the middle of the Window (see next slide)



PsychoPy *Routines*

Routines control the precise timing between *Components* (e.g. stimuli).

The "trial" *Routine* shown here has a text stimulus and records a keyboard response. This is all that's needed for a single trial in the Stroop task, for example.

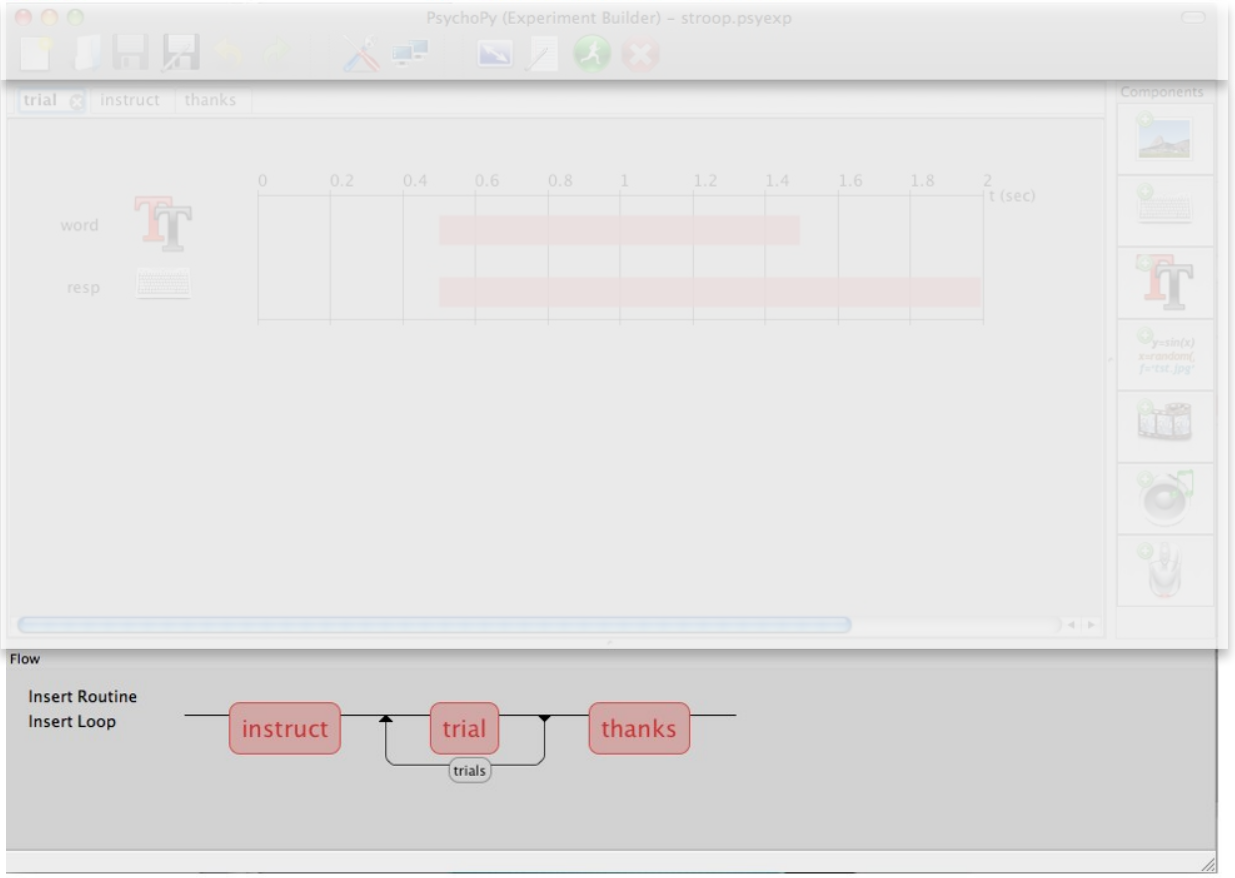


You can see two *Components* here, a text one and a keyboard input one (more on this later)

PsychoPy *Flow*

The *Flow* in PsychoPy determines the way Routines will be combined and/or repeated.

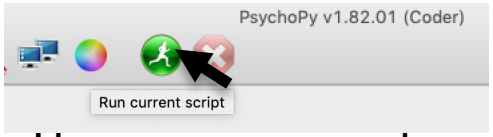
The *Flow* can contain loops controlling how a *Routine* (e.g. the "trial" *Routine*, as in last slide) is repeated, both in terms of how many repeats are made and how things change from one trial to the next



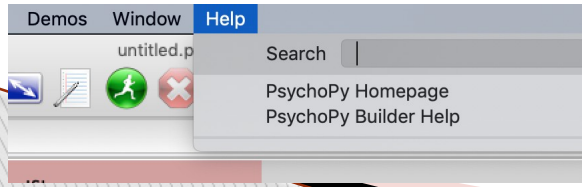
PsychoPy controls

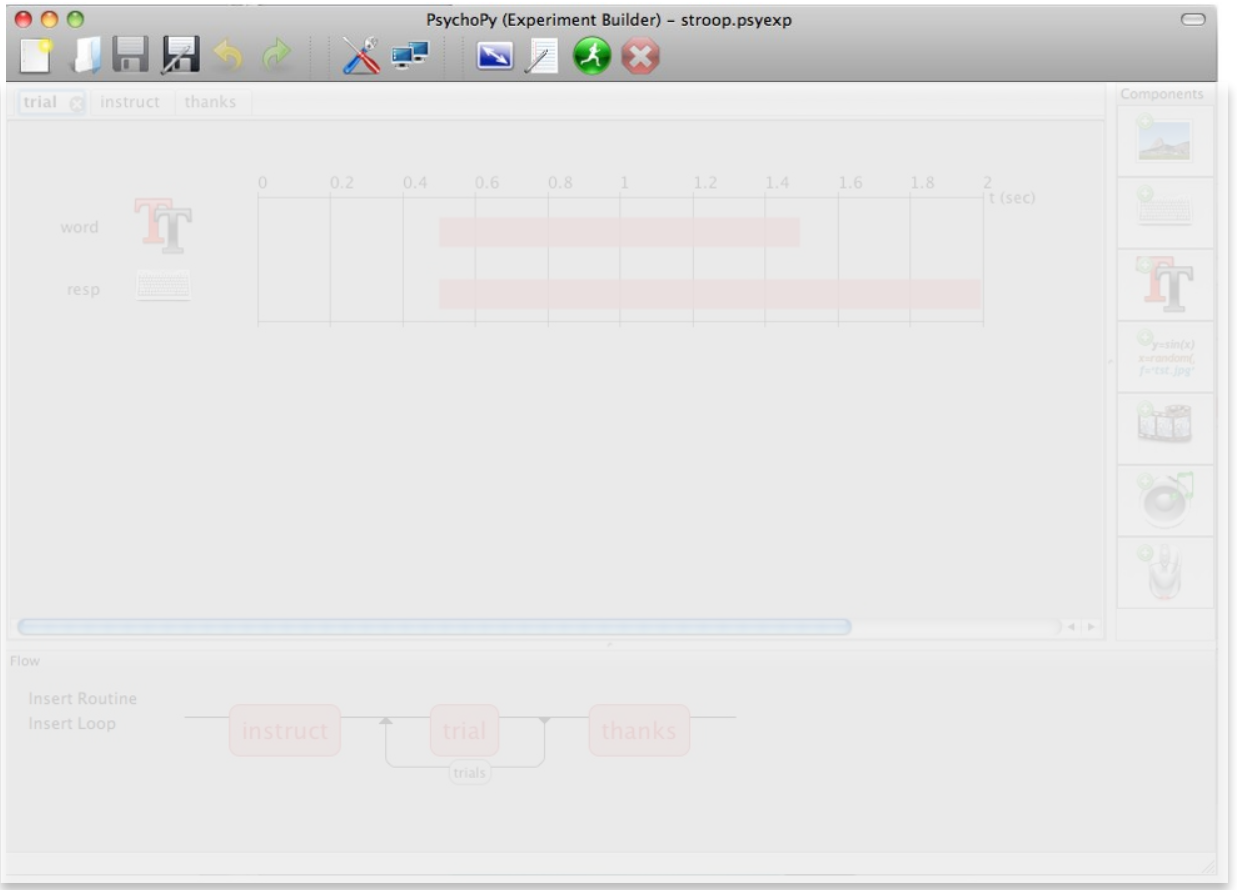
The top bar shows some basic controls.

Most buttons and entry boxes in PsychoPy will give you a ‘tooltip’ if you hover the mouse over them.

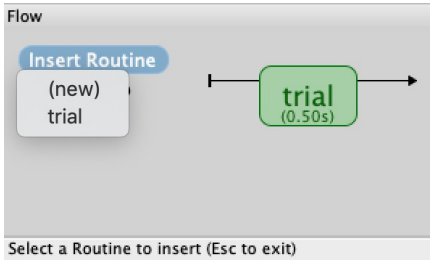


There is a general “Help” menu





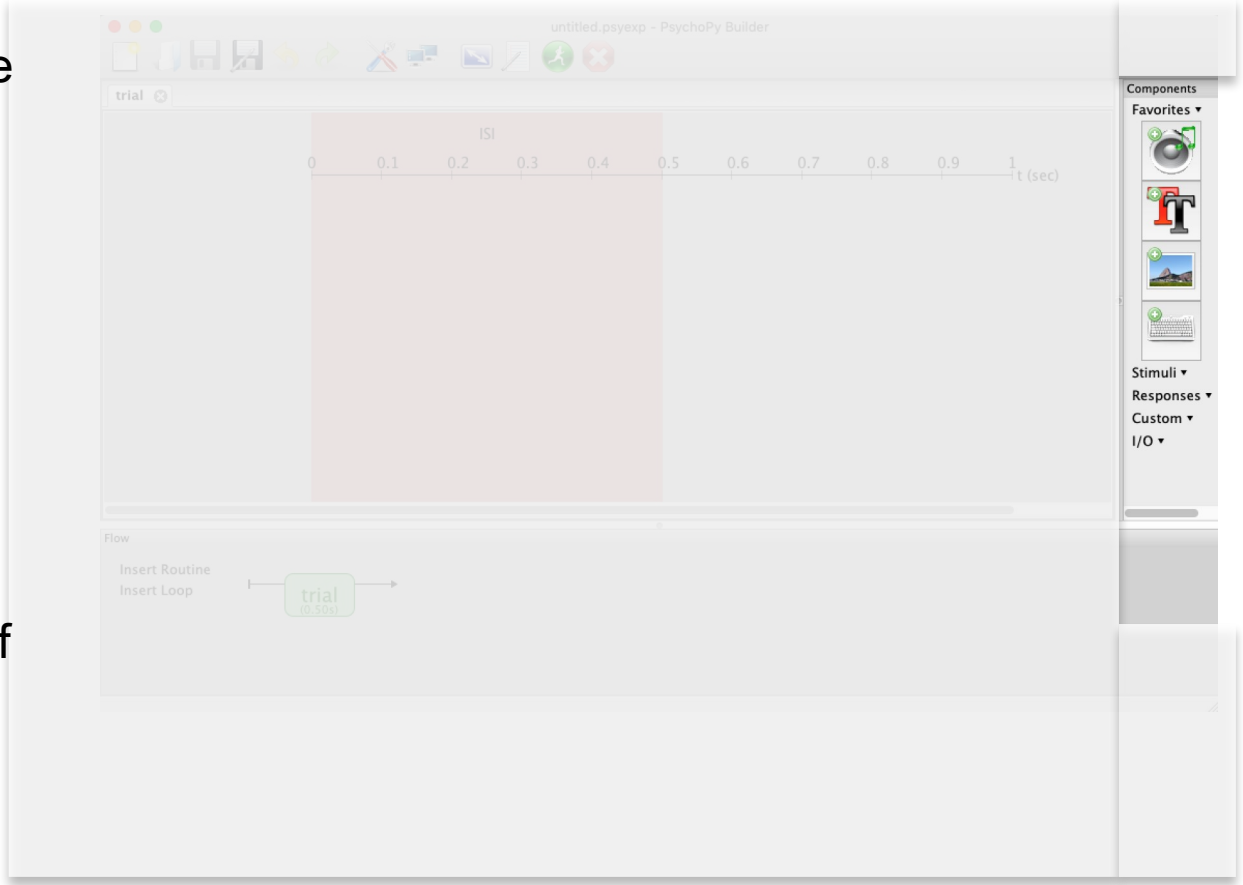
You may get extra tips at the bottom when you work on Flow



PsychoPy *Components*

The *Components* in PsychoPy are things like stimuli and response devices (e.g. keyboard) that make up the experiment.

When you click on the icons on the right a Component will be added to the current Routine (in the middle of the window). They each bring up a dialog so you can configure them…



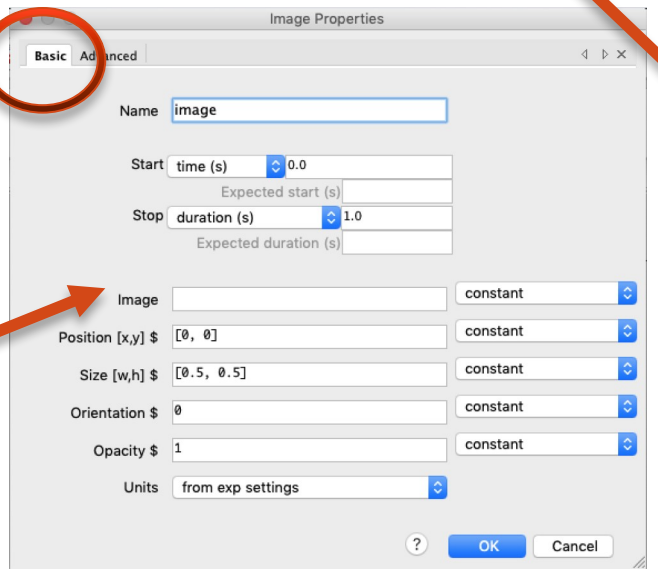
Let's look at some dialog boxes!

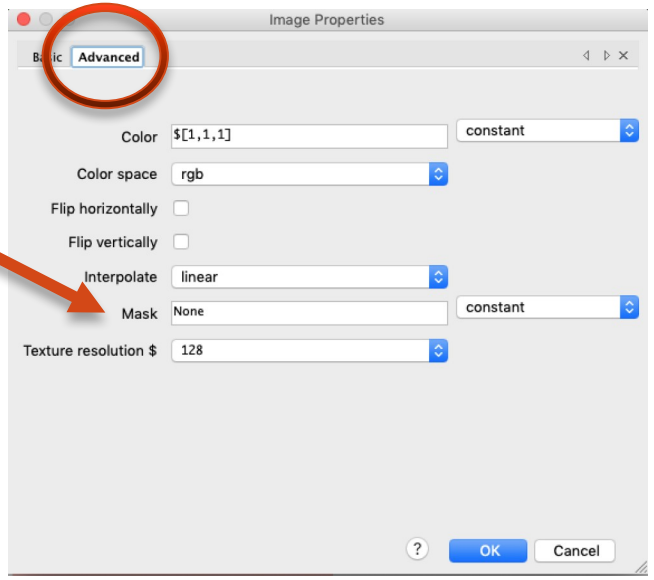
Patch Component

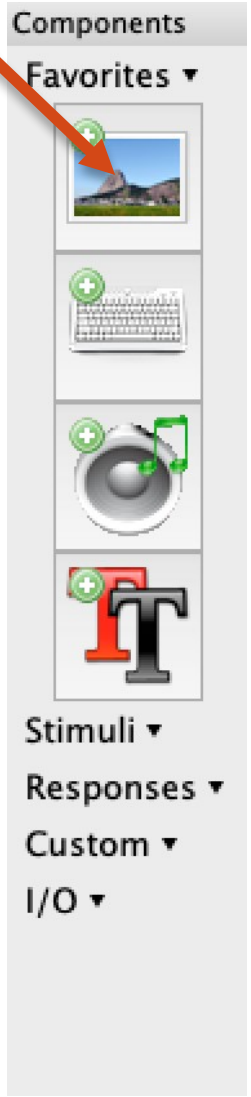
This Component allows you to present a patch of something; a picture, or a piece of 'texture'

The *image* setting allows you to specify an image file to use – or will present a *sinusoidal 'grating'* otherwise (that's a typical vision study stimulus)

The *mask* allows you to set a shape that the image will be seen 'through' e.g. a circle or a Gaussian window







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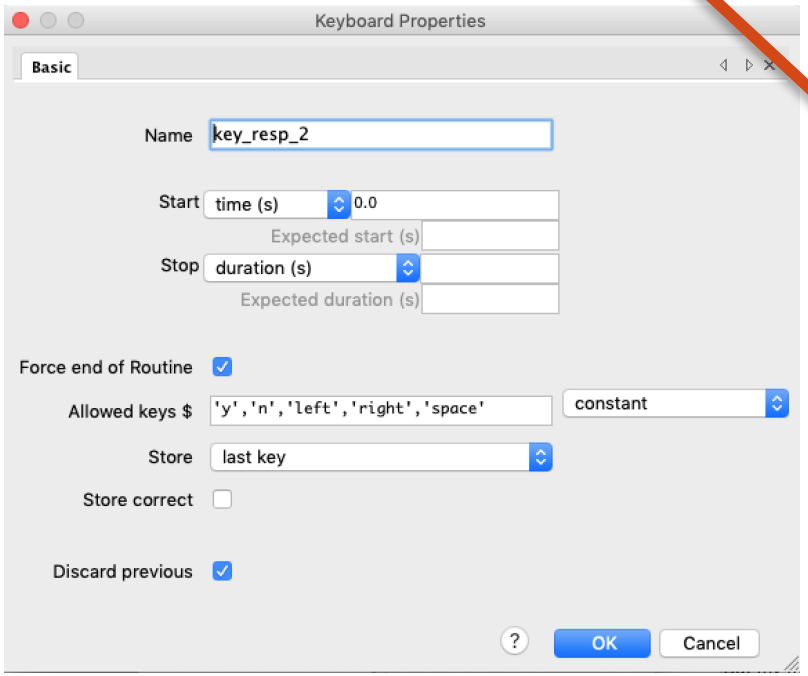
Common settings

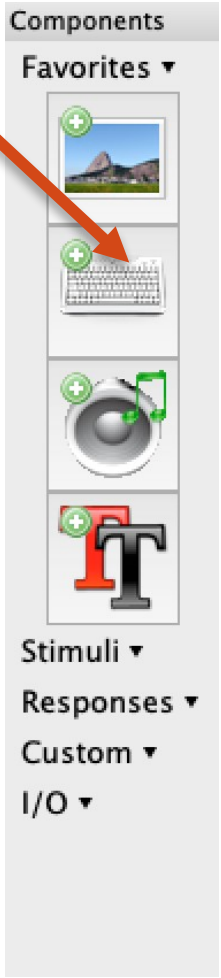
Many of the settings are used by lots of Components (including the Patch):

- **start time (seconds)** – the time after the start of the Routine that the stimulus will first appear
- **duration (seconds)** – the length of time it will last. If blank then the Component will go on indefinitely
- **units** – this determines how the size and position are specified
- **pos** – the position on the screen in the given units. [0,0] is the centre of the screen
- **size** – the size of the stimulus
- **orientation (degrees)** – most visual stimuli can be rotated on the screen

Keyboard Component

- Receives input from the keyboard
- Also has a *startTime* and *duration* (e.g. you may not want the subject to respond before the stimulus appears)
- If *allowedKeys* is blank any key can be used
- You can choose what you want to store about the keys and whether you want the Routine to end when a key is pressed
- Response time (if needed) is taken from the startTime





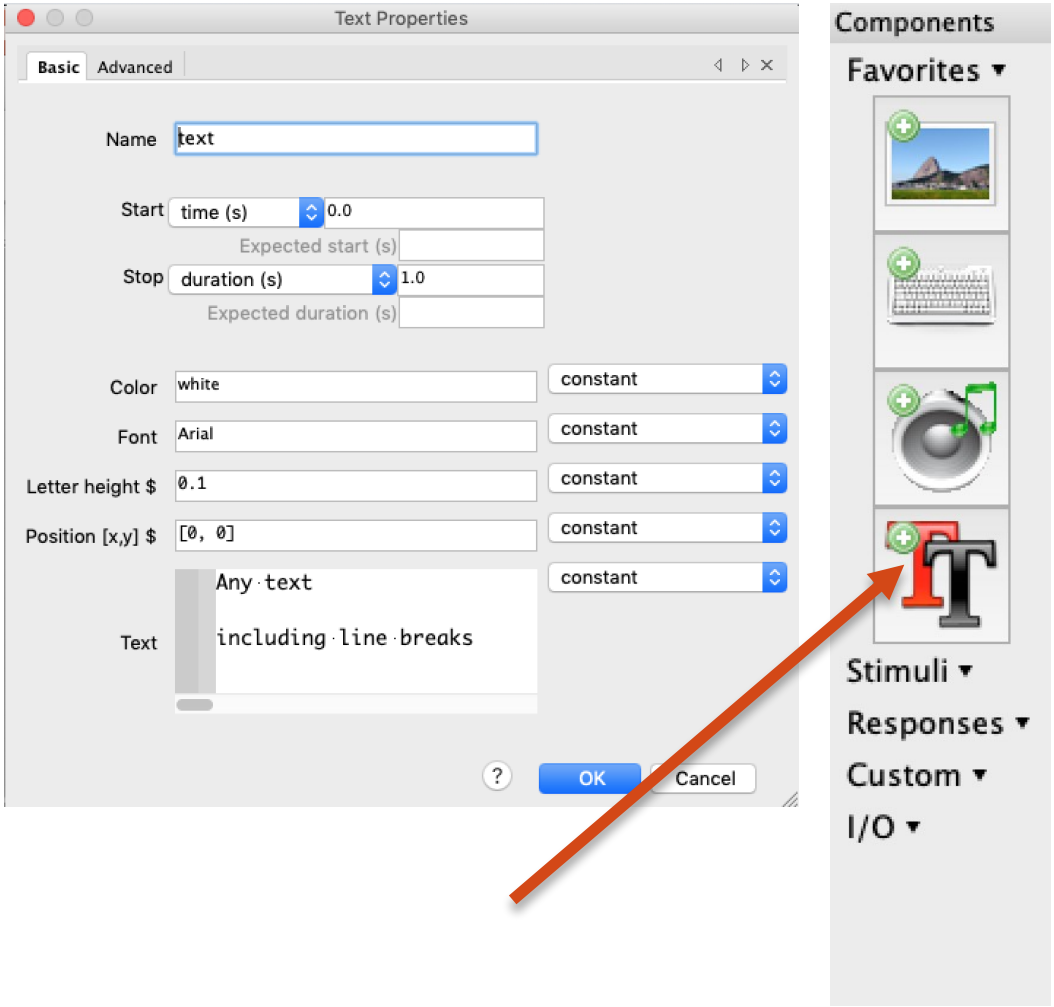
NB. If you want to *storeCorrect* (i.e. store whether the subject pressed the correct key) you need to tell PsychoPy what the 'correct' key is

Text Component

For displaying text on the screen

letterHeight is used here instead of size

For *color* you can give a named color from the link below or you can specify a 'hex' value (e.g. #EE3A8C for a strong pink) or many other ways



http://en.wikipedia.org/wiki/X11_color_names

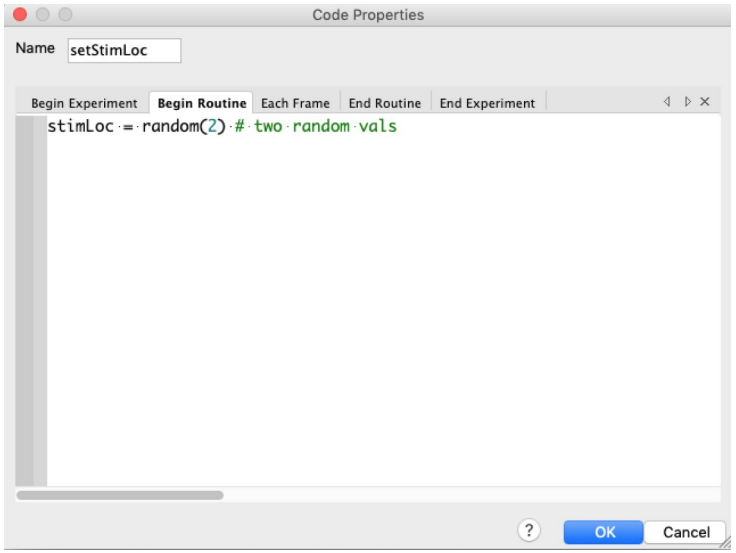
Code Component

The **code component** is a little more advanced

It allows us to create custom variables that can be used by other components

These can be set at different points in the experiment and used by components with settings starting "**$**"

e.g. we could set some text (in the *text component* that we have just seen in the previous slide) to appear at ***pos*=$stimLoc** and the code shown here will make it random on each repeat of the Routine





Sound Component

No prizes for guessing what a Sound Component does!

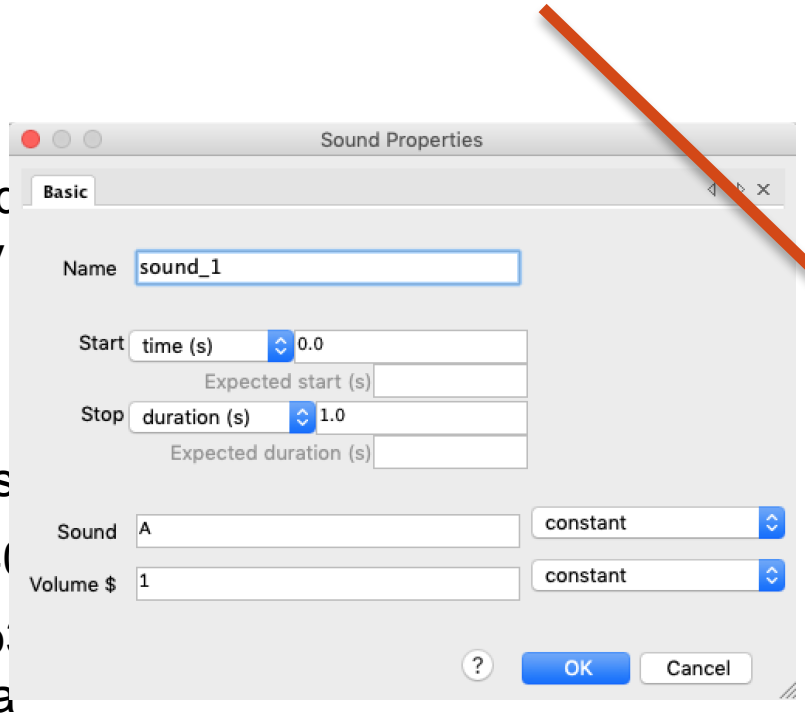
In this case “sound_1” is a sound already loaded into PsychoPy

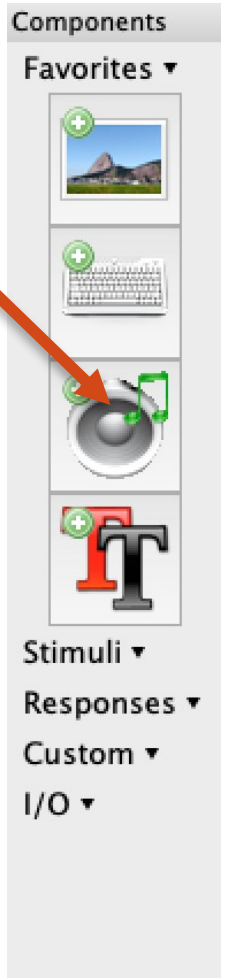
In the *sound* setting you can specify;

→ a note name (e.g. A, Bfl, Cs

→ a frequency in Hz (e.g. $44(

→ or a filename for a wav, mp3 or mp4 file. If the sound is a file the *duration* is ignored





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PsychoPy and the $

What was the $ for?

- most PsychoPy inputs are interpreted as *text*
- the $ symbol announces that this is *not* text
- that's important if you need to specify that the value is:
  - a variable name
  - a number
  - a list of values (e.g. for RGB colors, $[1,-1,-1] refers to *red*)

What if I want to insert an actual dollar symbol in text!?
e.g. I want to print, "$5.00"

- precede the dollar with a backwards slash: \$5.00

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Component names

In PsychoPy almost everything you create needs to be given a name

The name must;

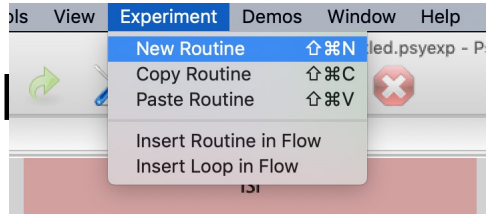
- →be **unique**
- →not contain spaces, punctuation (except underscore _) or mathematical symbols

e.g. if you have a Routine called ‘feedback’ you can’t have a Text Component called ‘feedback’

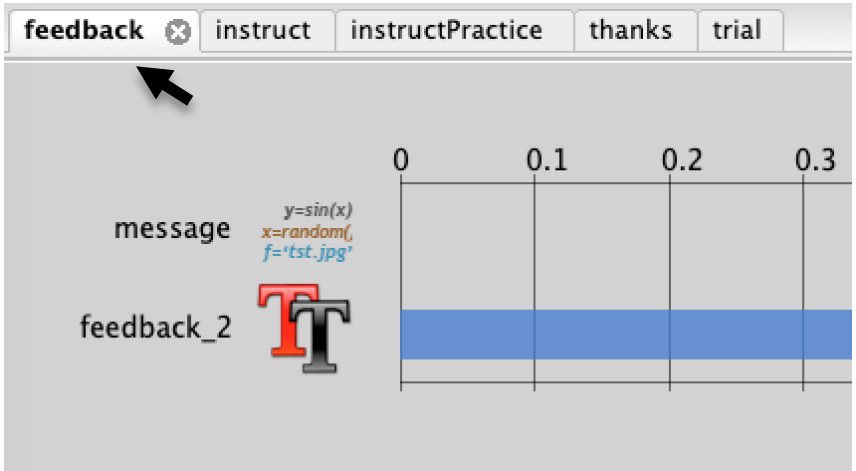
Routines

You can have as many Routines as you like (they also need names, following the same rules)

Create them by going to the menu item >Exp Routine…

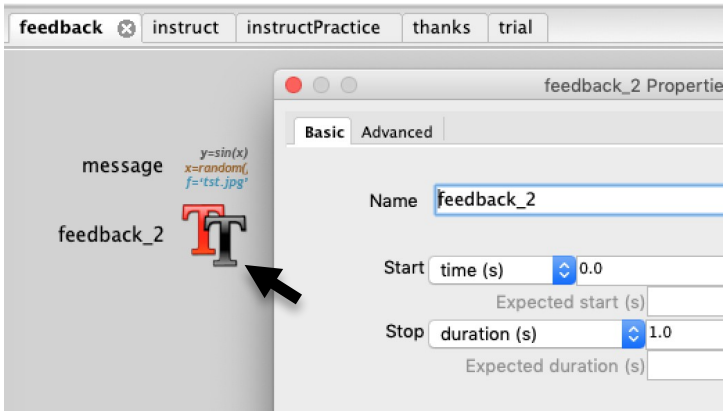


You can switch between your Routines by selecting the different tabs

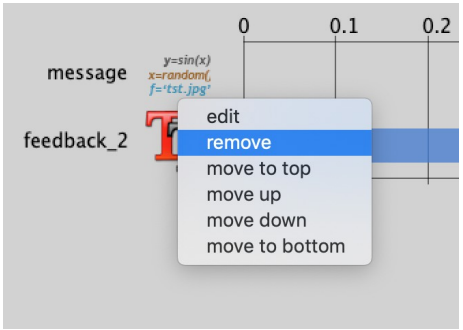


Routines

If you want to *edit* a Component that you've added, click on it with the mouse



If you want to *remove* a Component *right*-click on it and select 'remove'

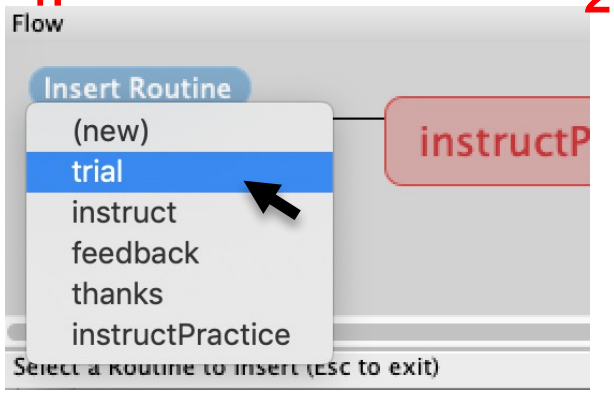


Using the Flow: Routines

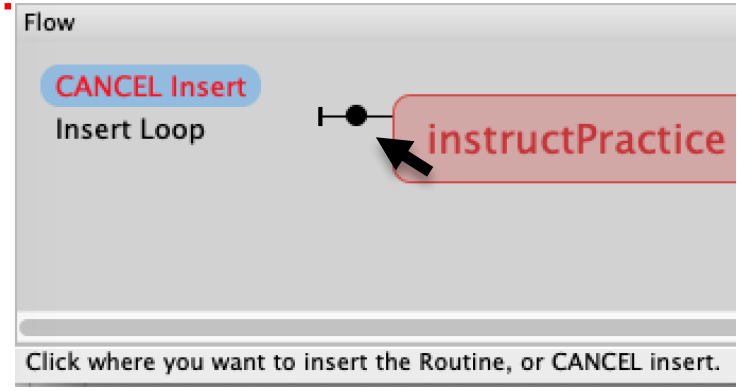
You can combine *Routines* in the **Flow panel**

To add one of your *Routines* to the Flow (you must create it first) click on “Insert Routine” in the Flow panel and select where you want it to go

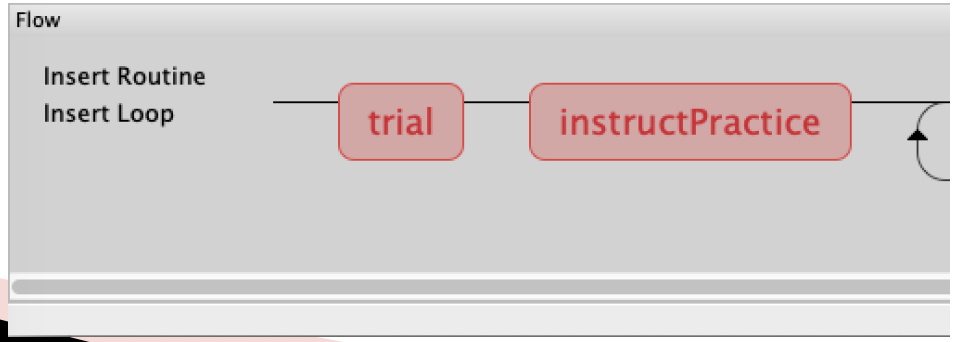
1.



2.



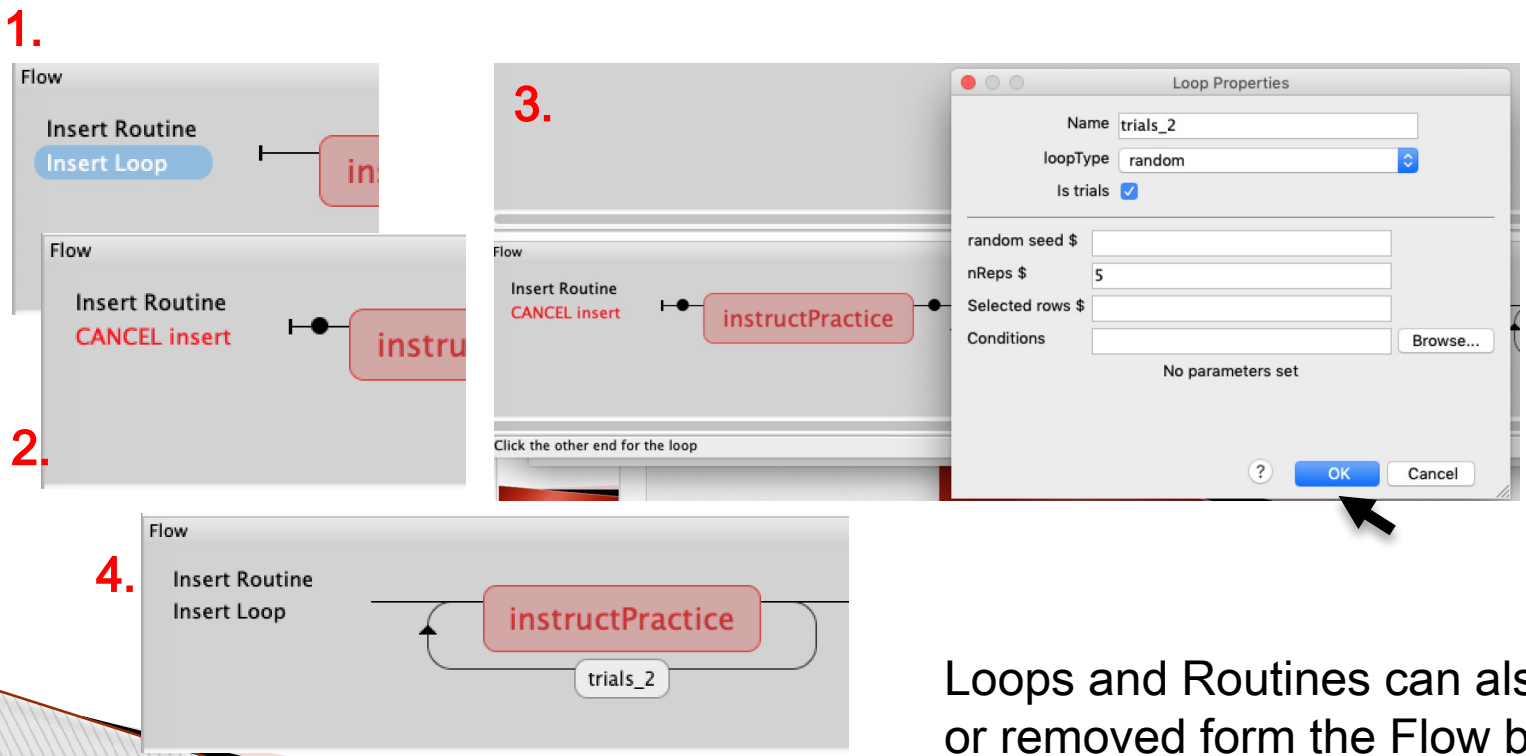
3.



Using the Flow: Loops

If you want something to repeat (e.g. to run multiple trials) then you can “Insert Loop” and select the points where you want to start/finish

- loops can span across multiple Routines
- loops can nest (you can have loops around loops)



Loops and Routines can also be edited or removed form the Flow by clicking or right-clicking

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Setting trial types (conditions)

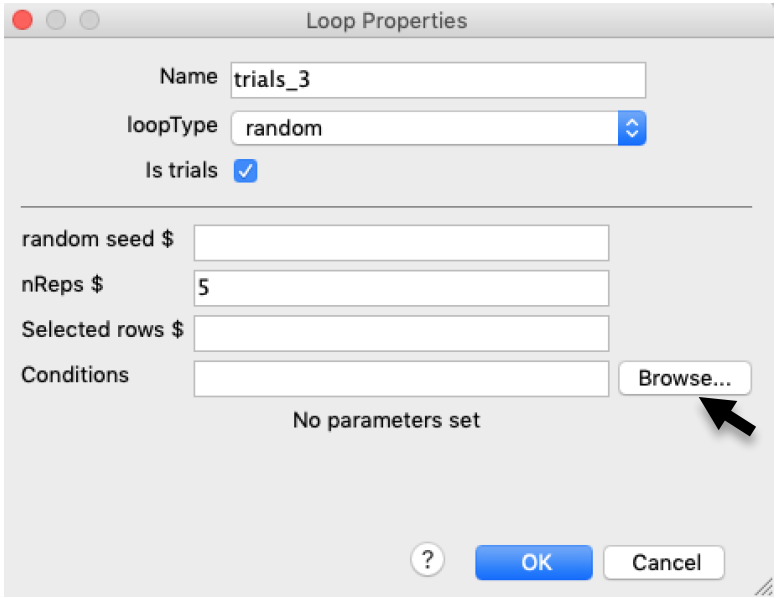
Usually when you repeat trials you want things ('parameters') to change from one to the next

This is handled by the Loops that you set in the flow

When you insert (or edit) a Loop you can can select a *trialListFile* in the dialog box by clicking on "Browse"

This file is **an Excel file** (2007 or later) that has one row for each type of trial and one column for each parameter

Parameters can then be accessed by components using **$** and can change on each repeat through the loop



Mental Rotation

Measuring Mental Imagery

The concept of mental imagery can be traced back to **Galton (1883)**

→gave a questionnaire to 100 people asking them to remember their breakfast table and answer some questions about the images that they had

With the questionnaire, Galton created a measure of imagery that was related to sex, age, and other differences specific to individuals

The basic findings were that there are striking individual differences in the ability to form mental 'images'

Dual Coding Hypothesis

Paivio (1971) proposed the Dual-Coding hypothesis

The basic tenet of this theory is that information may be mentally represented either in a verbal system or a nonverbal (analogical) system

- → Each system contains different kinds of information.
- → Each concept is connected to other related concepts in the same system and the other system.
- → Activating any one concept also leads to activation of closely related concepts.

Pictures in the Head

Pylyshyn (1973) argues that whatever a imagery might be, it cannot be a 'picture in the head' or a 'mental photograph'

→There would be far to many of them

→There no possible means of organising them

Imagery is 'conceptual' and must be constructed from a more abstract form

→The presence of imagery is epiphenomenal, i.e. not the functional process itself

Experiments on the Rotation of Mental Images

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Roger Shepard and his colleagues designed a series of studies that looked at the extent to which people could manipulate their own mental images

Shepard & Metzler (1971)

- →showed subjects pairs of 3-D line drawings
- →1600 pairs were generated
  - →In some pairs the second image was a rotation of the first
  - →Some pairs contained two different images
- →The rotations varied from 0 to 180 degrees

An example pair of stimuli

The picture to the right shows some typical pairs of stimuli taken from Shepard & Metzler (1971)

- *Science*, 171, pp701-703.

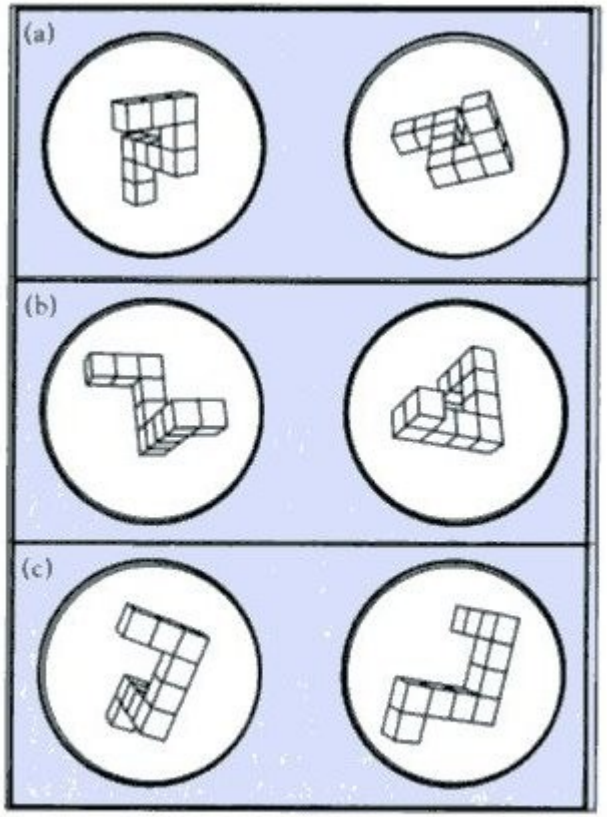
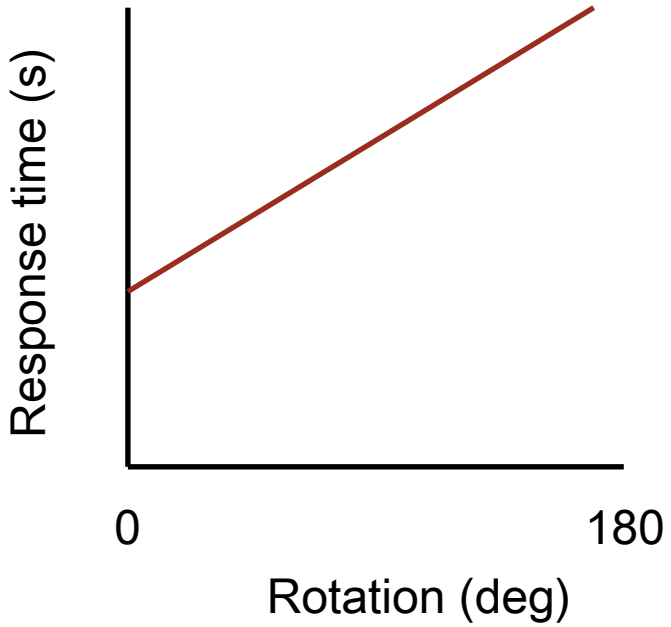


FIGURE 7.8 *Examples of pairs of patterns differing in orientation*

Results of the Experiment

- The subjects' task in the experiment was to decide whether the two images were the same or different
- The graph on the right shows the time to respond to pairs of stimuli as a function of the difference in degrees between the members of the pair



Rotating Letters

Cooper & Shepard (1973) extended the findings by examining whether similar effects could be found when subjects had to recall a particular image

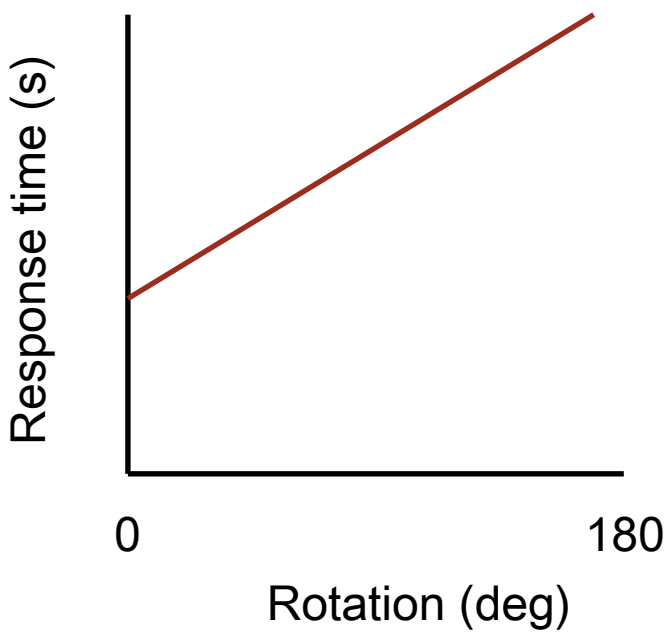
Subjects had to judge whether the letter was ‘normal’ or presented as a ‘mirror’ image



When the letters were rotated the same results were found

This week's study

- A replication of Cooper & Shepard's (1973) experiment using letters
- The analysis of the data will look at the **correlation** between the RT and the angle of rotation
- NB It is possible to use Pearson's coefficient of correlation to examine experimental data, not just data from *correlational design*!



Creating the PsychoPy experiment

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There are a number of steps to creating an experiment in PsychoPy:

1. Setup the way the **types of trials** and how they differ (in Excel)
2. Create **settings** for the monitor and experiment
3. Setup the timing and structure of each part (***Routines***) of the experiment
4. Setup the way that the Routines will be combined in the ***Flow***

To start, **create a folder** to save your experiment in and **download the 4 image files** to be used (*.png files)

Setting up trial types

In most experiments things differ from one trial to another in one or more ways

We have seen that in PsychoPy you can control these changes using a spreadsheet of 'Trial Types'

In the spreadsheet;

→ each **row** will represent one type of trial that can occur

→ each **column** will represent a variable that determines some aspect of the trial (e.g. what image to present, what the 'correct' answer is,…)

Creating our 'trial types' file

Our study today will use a pair of letters, G and R, that are:

- either reversed (mirrored) or not
- presented at various angles

These will come from image files.

Subjects will have to hit one of two keys depending on whether they think the letter was reversed

Open a new document in MS Excel and create column titles in the first row with the names;

image, mirrored, orientation, corrAns

When you give names to columns like this you must **not use spaces or punctuation**. We've used a capital A to show that corrAns represents two words

Creating our 'trial types' file

In the columns we will insert the following info:

- → image:
  the name of the image file (G.png, revG.png, R.png, revR.png)
- → mirrored (reversed):
  0 (not reversed) or 1 (reversed)
- → **orientation**: (tip: start with this one)
  a complete set of 0,10,20,…180 for each of the 4 stimuli
- → corrAns:
  left or right (left cursor when 'mirrored' column value =0, right cursor when 'mirrored' column value =1)

You should end up with 76 trial types/rows (your excel file will go down till row 77, because you have one row of headers).

Please refer to the video on how to create and set up the file.

Creating our 'trial types' file

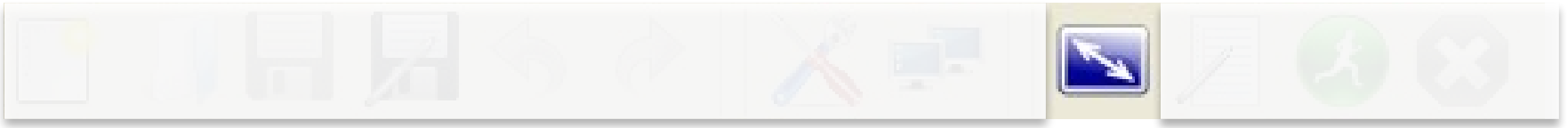
- Always check very carefully that the Trial Types file specifies the conditions exactly as you want them. One very common place for mistakes in experiments is when the experimenter has forgotten to update the conditions correctly after copy/paste
- Save the file as trialtypes.xlsx (or something else that's obvious) ***in the same folder as the experiment***

Create a new experiment in PsychoPy Builder

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Open PsychoPy, go to the Builder view

Set up the properties of the Experiment by clicking the button marked marked like the diagonal of a screen:



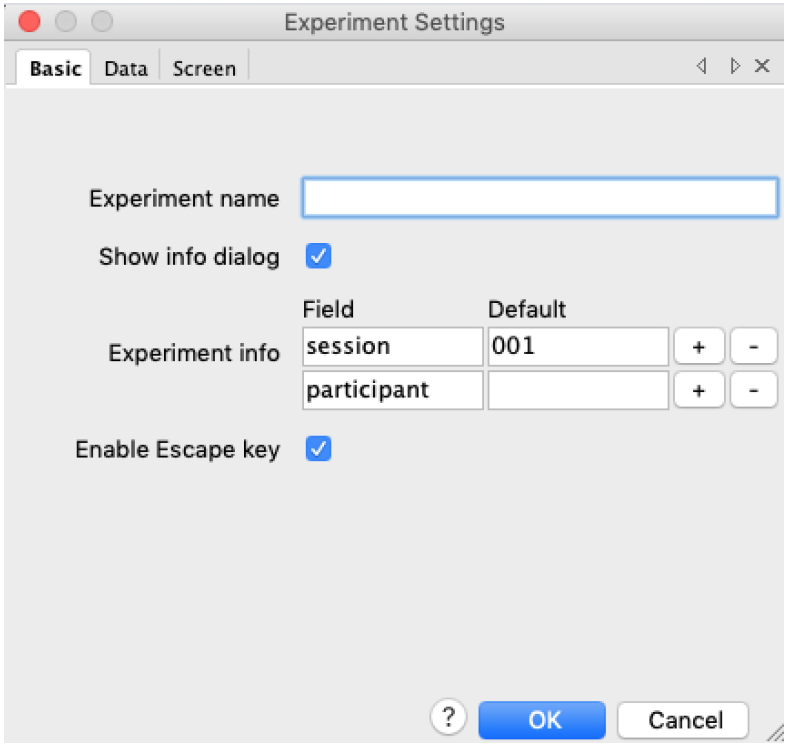
Remember, you can always get a hint about what a button does by hovering the mouse over it

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Setting the experiment properties

The dialog that comes up allows you to set various things about the experiment in general, such as the way the stimulus window appears and the dialog that gets info from subjects.

For most dialogs, you can get help on what the settings mean by clicking the help icon.



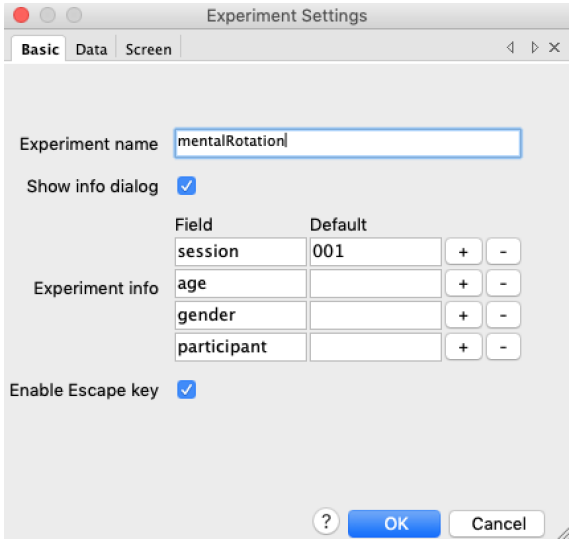
Setting the experiment properties

In the dialog, one of the settings says ‘Experiment Info’ and another says ‘Show info dlg’

This allows us to present a dialog to subjects and control what gets stored

Let’s add boxes to ask for the subject age and gender, useful for writing the methods section

Hit OK to close the dialog



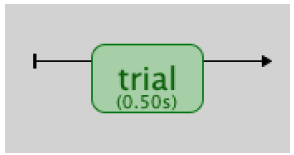
Save your experiment

Save your PsychoPy experiment in the **same** folder as the trial types file and image files

Creating your trial Routine

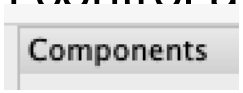
Most experiments have several *Routines*, one of which usually controls a single trial (meaning by that what usually is a *block* of trials, because of the reps)





Timing of events within a Routine is generally very precise

Within a Routine you can have many *Components* that each control a stimulus, or method of responding etc



Components get added to the Routine by clicking the buttons on the right of the Builder

After being inserted you can edit a Component's settings by clicking on its name or icon

In our study, we want to have a fixation point, followed by our stimulus, and then give subjects the chance to respond with one of two keys

Adding a fixation point



There are various things we could use to guide our subjects' fixation. A simple one is to create a cross by presenting subjects with the character '+'

Add a **Text Component** to the *trial* Routine by hitting the button marked like a pair of Ts (as above)

Give you text object the name *fixation*

Set its actual text to be simply +

Set its duration to be 0.5 (for 500ms)

Set color to *black*

Hit OK

You can always go back and edit the fixation by clicking on its name or icon

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Create the main stimulus



We want to present one of four images, at many orientations, based on parameters in our trial types file

Add a **Patch Component** (this is usually an image) with the icon above

Set the name of the stimulus to be something that you will remember, and not the same as anything else, e.g. *target*

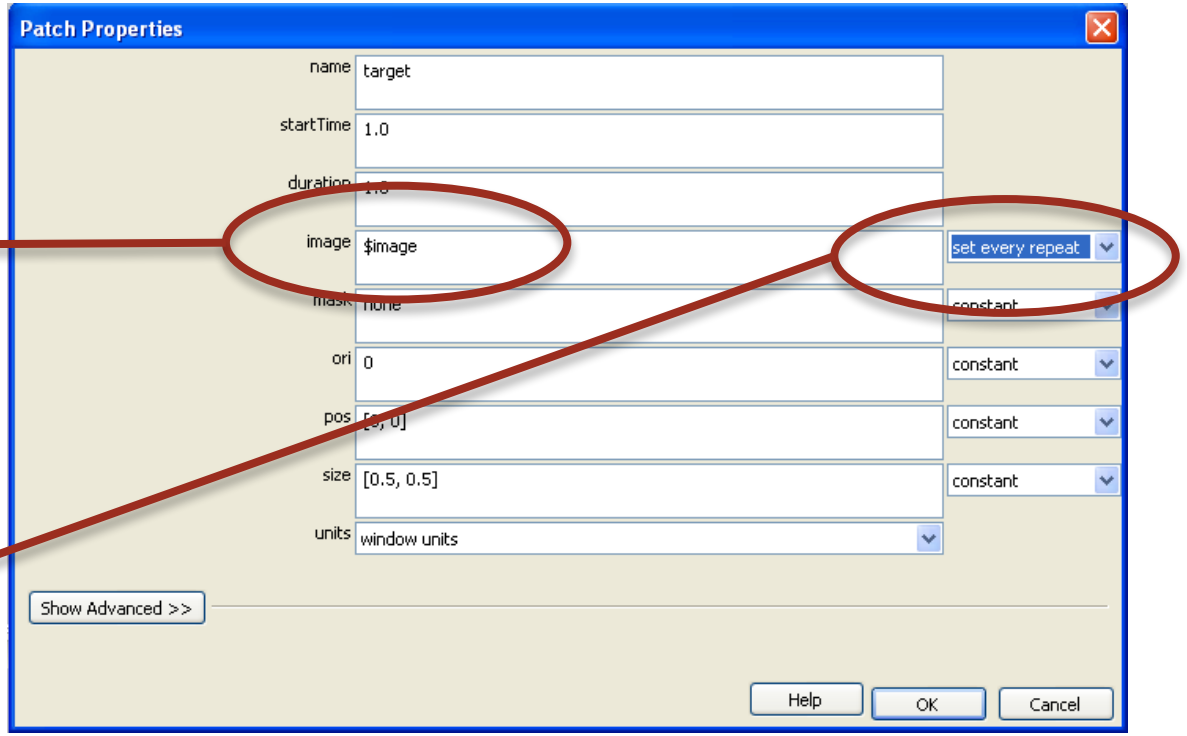
Set the *Start time* for the patch to be 1.0 (seconds) and the *duration* to 3.0 (seconds)



Create the main stimulus

In the trial list we had a parameter called *image*. We can refer to that here using $

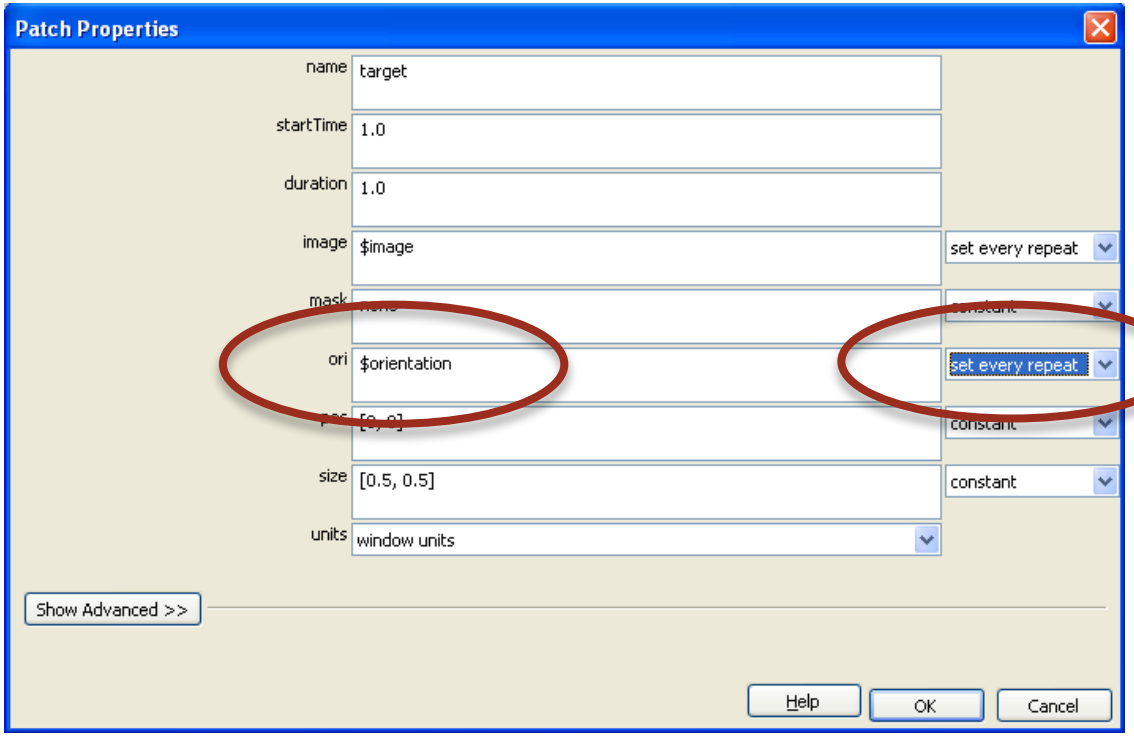
We need the stimulus to change on each repeat (i.e. each trial)



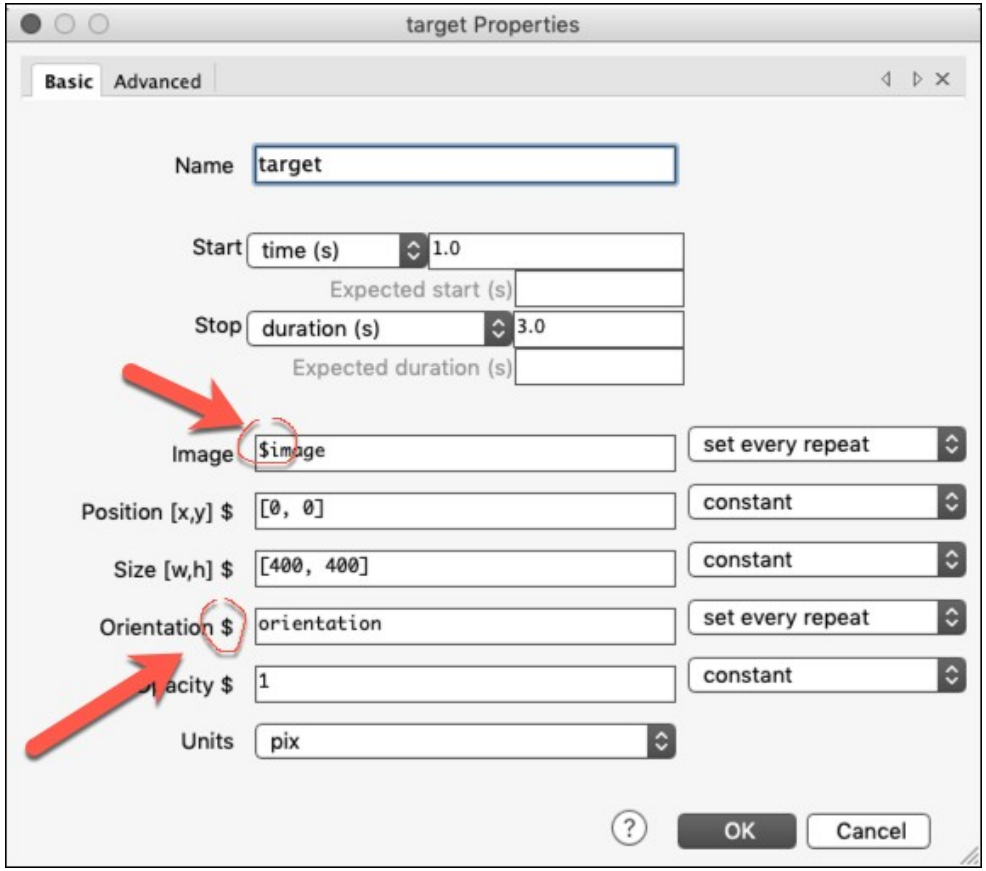
Stimulus *Orientation*

Stimulus orientation also needs to be set from your file and changes on every repeat of the Routine

See next slide!



Stimulus *Orientation*



IMPORTANT

This is how the window will look on our version of PsychoPy

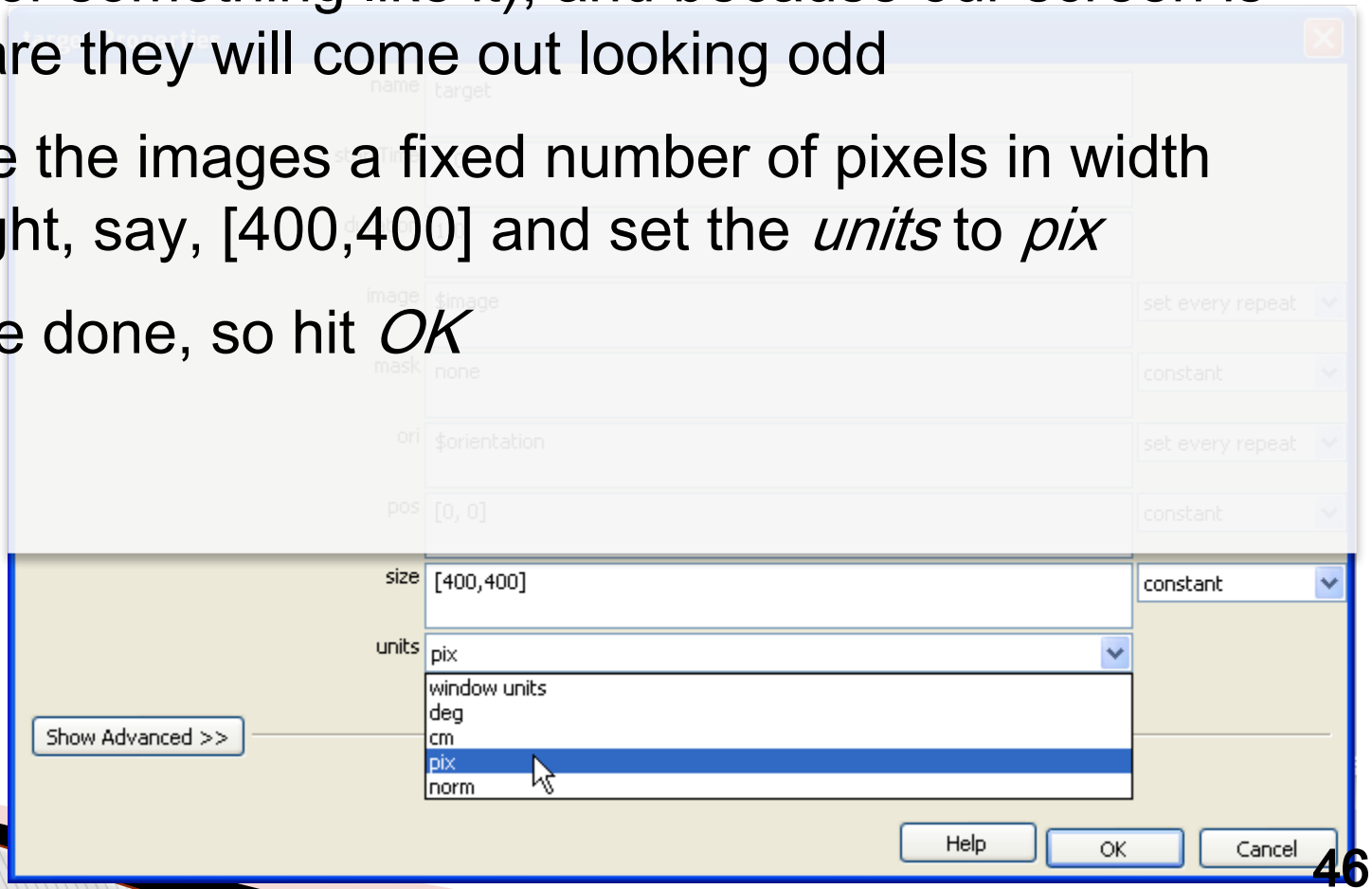
Add the $ for image, but not for orientation! It's already "added"

Stimulus *size*

By default the size of our stimulus is based on fractions of screen (or something like it), and because our screen is not square they will come out looking odd

Let's make the images a fixed number of pixels in width and height, say, [400,400] and set the *units* to *pix*

Then we're done, so hit *OK*



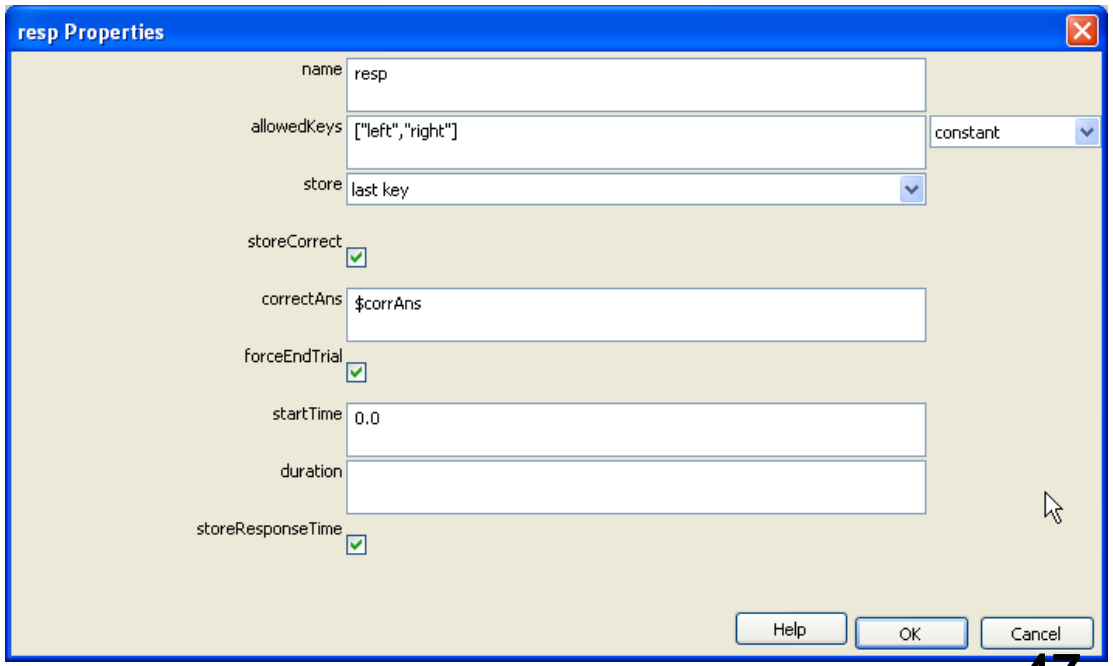
Get a response



To get a response from the subject we usually use the keyboard

Insert it with the keyboard icon

This is already set to use the ‘left’ and ‘right’ keys (the 4 arrows under the return key)



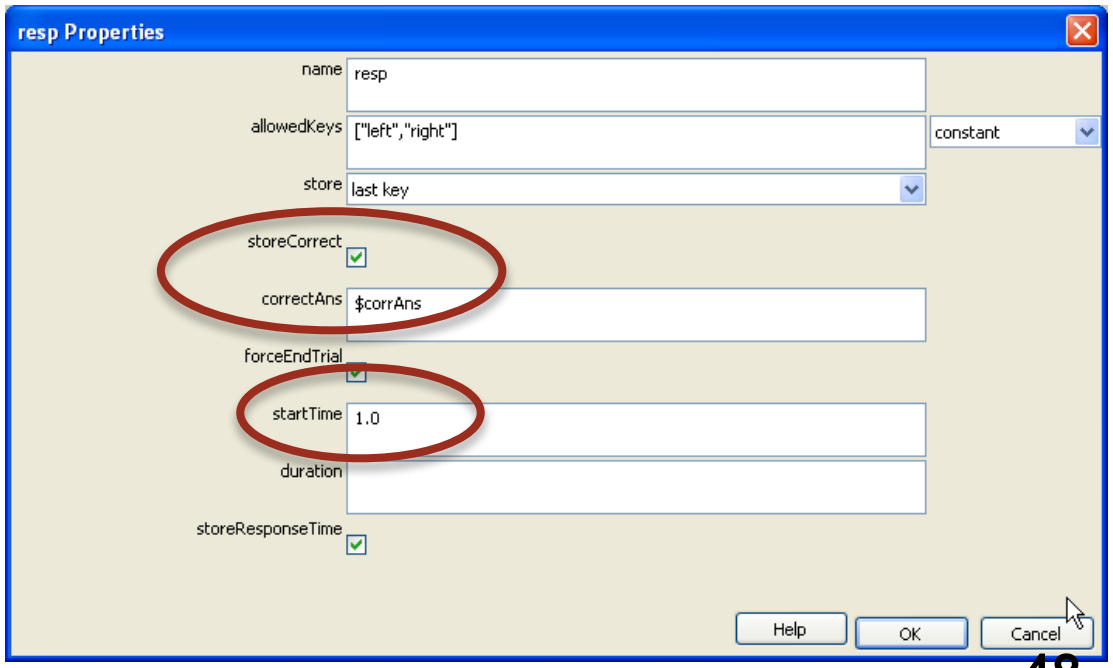
Get a response



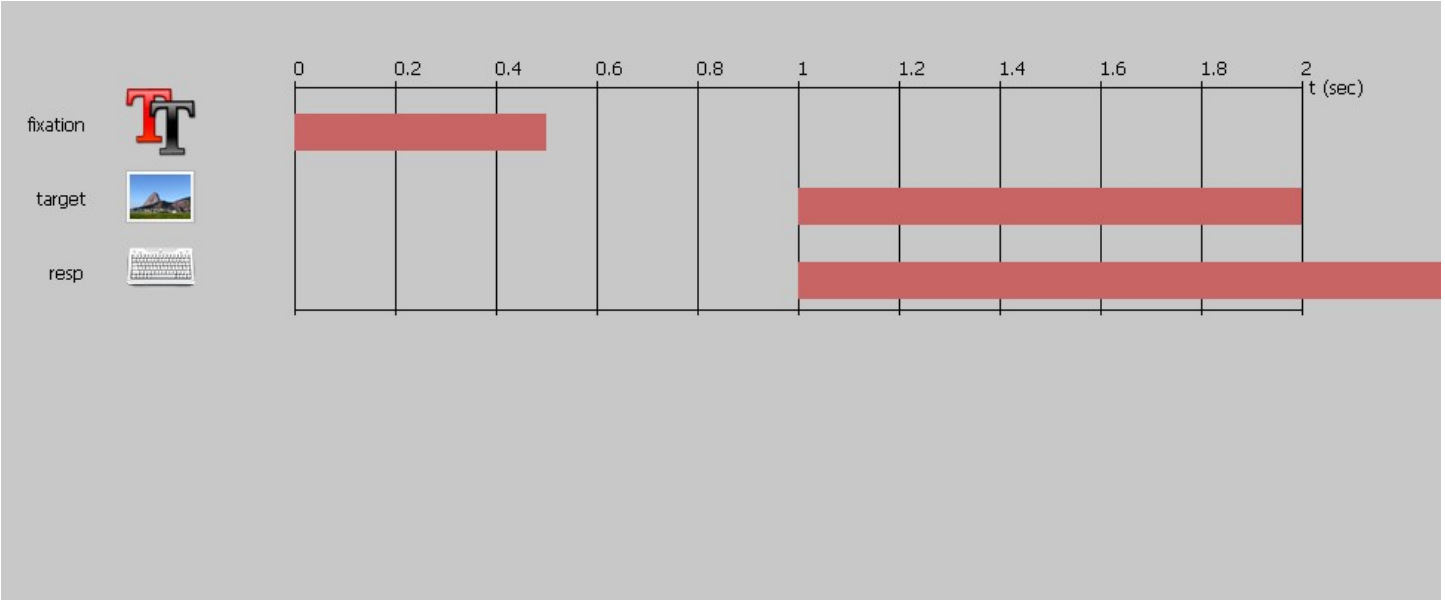
We need to tell PsychoPy what the correct answers are. These are stored as corrAns in your file.

Tick the box *storeCorrect*
and set the *correctAns* to be $corrAns

You can leave duration blank (infinite) but set the start time to be 1.0. We don't want the subject responding *before* the stimulus is visible



Overview of *trial*

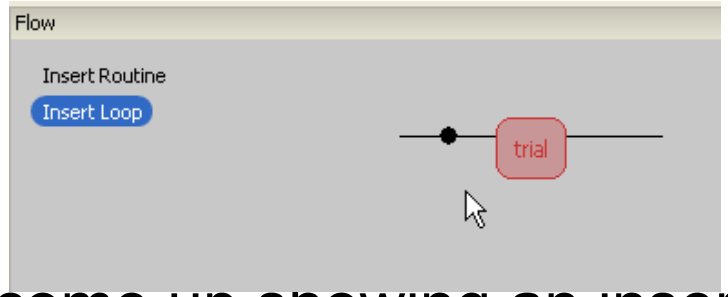


Your trial should look like this.

Note how the *resp* time bar goes off the end of the view (to infinite), because it only stops when a key is pressed

Add a loop to repeat trials

We want the trials to repeat. In the Flow panel (bottom of the Builder view) click the ‘Insert Loop’ button once

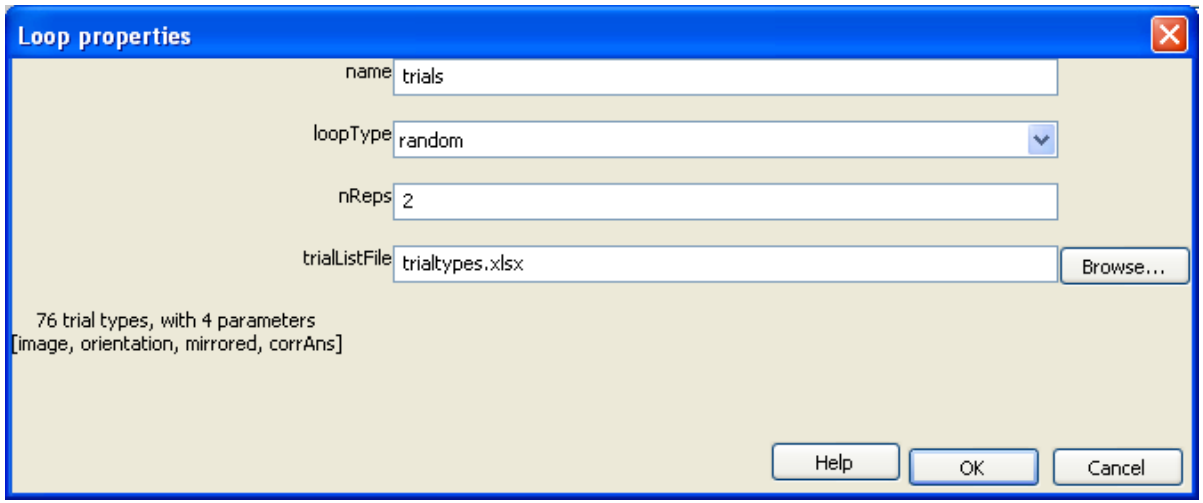


An icon will come up showing an insertion point. Click once on each side of the trial box

Add a loop to repeat trials

As you select the second endpoint for your loop a dialog appears

Click on the Browse… button select your trial types file (from excel). PsychoPy will summarize how many types of trial there are and how many parameters/variables



Also, set the nReps to 2 (5x76 will take too long!)

Adding instructions

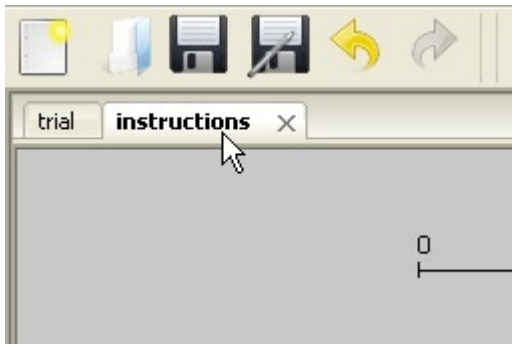
Let's add some instructions

For this we need an extra Routine, to be positioned outside the trials loop

From the >*Experiment* menu select *New Routine*

Give the new Routine the name *instructions*

A new tab will appear in the set of Routines, but you may need to select it



Adding instructions

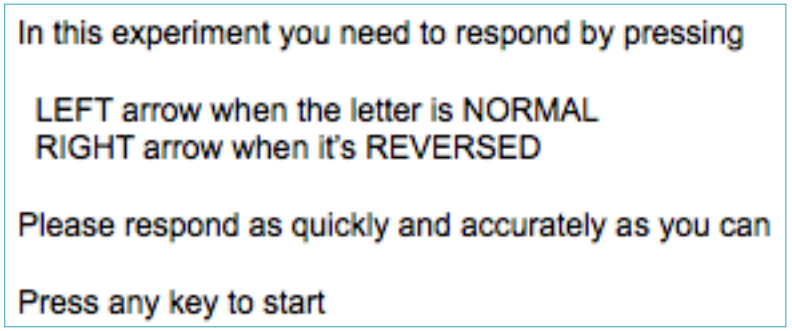


Insert a new Text Component

Give it the name *instrText* (we can't call it *instructions* because we used that name for the Routine we just created)

Set the *duration* to be blank (infinite)

Type some instructions into the *text* field, telling the subject what to do



NB. If you have lots of text you may need to reduce the height of the letters a little

Ending instructions

We told the user to press any key to begin. We better set that up!

Insert a Keyboard Component

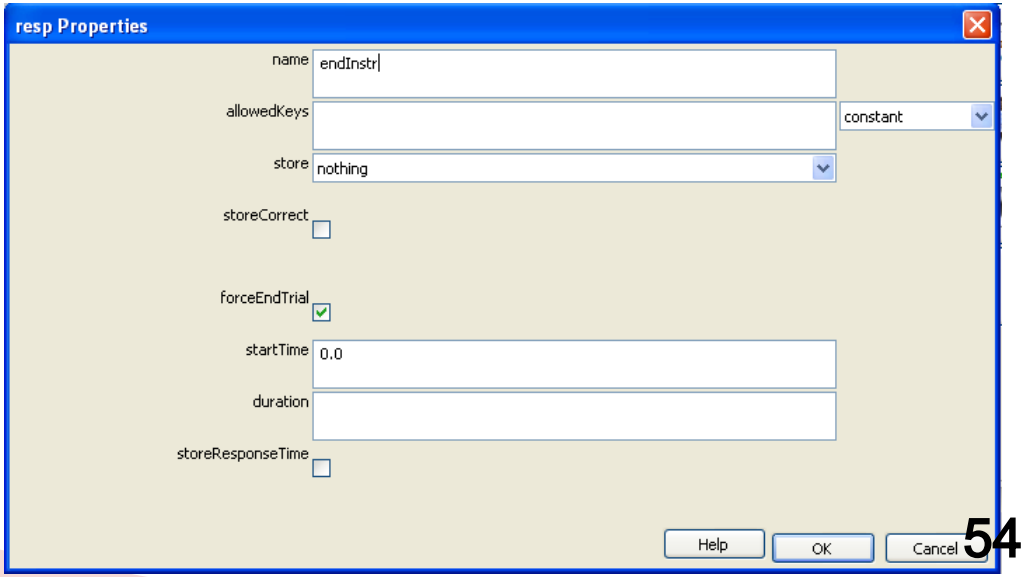
Set the *name* to be *endInstr*

Set the *allowedKeys* to be blank so that any key can be pressed

Set the *store* value to be 'nothing'

Also uncheck the *storeResponseTime* setting at the bottom:

Hit OK

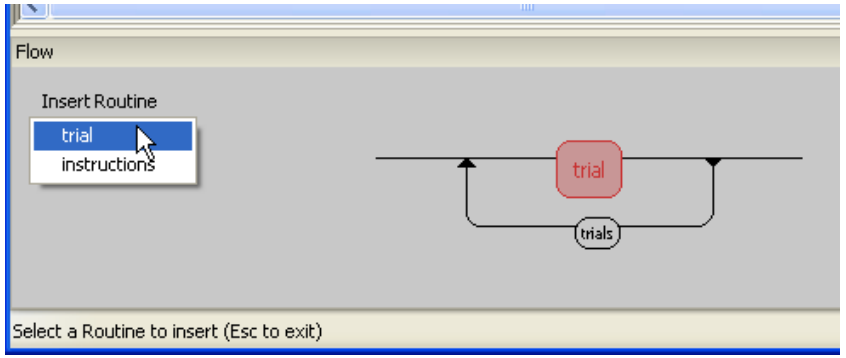


Inserting instructions

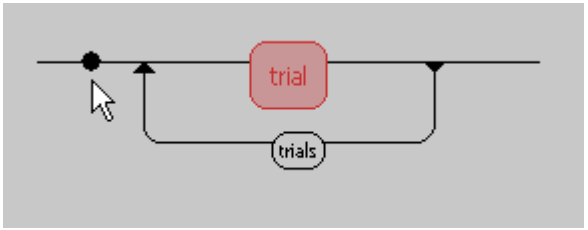
Now we need to add that Routine to the Flow

In the Flow panel press (once) the *Insert Routine* button

Select the Routine you want to insert



…and then the place you want to insert it



NB. If you insert your Loop or Routine in the wrong place you can right-click it and ‘remove’

Copy/paste a Routine

You could also add a thank you/goodbye message (that encourages subjects to leave once you're finished!)

That's going to be very similar to your instructions Routine

Make sure your *instructions* Routine is selected and go to >Experiment>Copy Routine

Then select >Experiment>Paste Routine

This is particularly handy for long/complex routines, and it can be done between different experiments too – but then you may need to make sure that the variables have the same names!

Alter your goodbye message

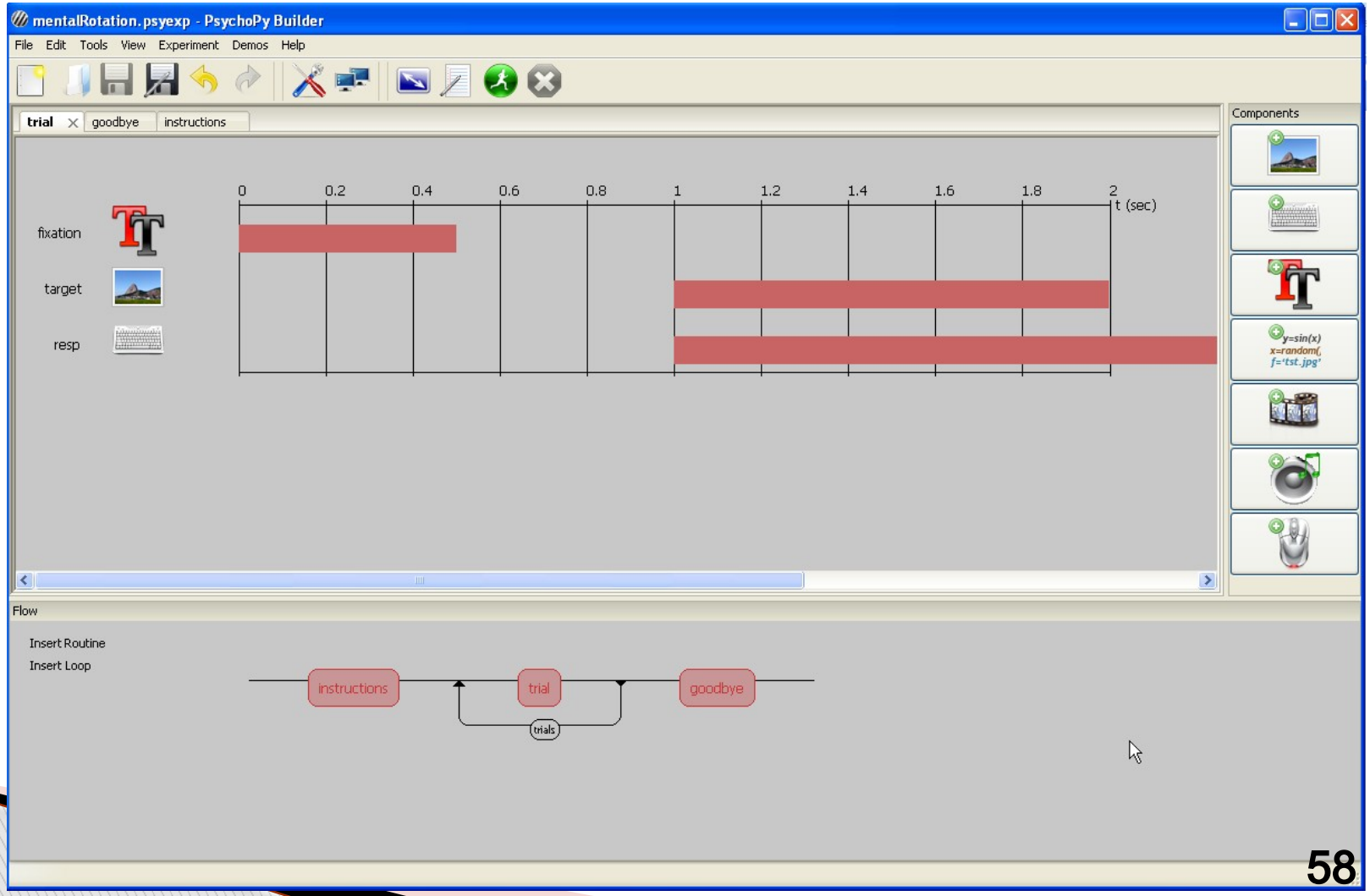
In your goodbye Routine, you need to;

- →Rename the *instrText* Component to be called something new (e.g. *thanksText*)
- →Give it some new text (obviously!)

- →Rename the Keyboard Component too

The end product

Remember to save!



Data Analysis

Analysis of data

Today, we're going to determine

→for each participant, the strength of relationship between orientation and RT (using a **correlation coefficient**)

Next week we will determine (I will do this!):

→whether this is significantly greater than zero on average across subjects (using a **one-sample t-test**)

Before we start the analysis:

→Create a new copy of the data file for yourself, so that your analysis doesn't change the original file (raw file)

Excel analysis

This is how the analysis in Excel will unfold step by step:

1. get rid of the trials for the reversed stimuli (they might differ from trials with the 'normal' stimuli)
2. filter out incorrect trials
3. take the average RT for the 4 remaining trials for each orientation (2 trials with 'G', 2 trials with 'R')
4. correlate this average RT with the orientation of the stimulus
5. Insert x-y scatter

1 – get rid of trials

1 - get rid of the trials for the reversed stimuli

→ Select all and sort by image first, then trial number, then orientation

→ Get rid or rows with reverse trials

→ Get rid of extra columns

2 – filter out incorrect trials

2 - filter out incorrect trials

→ Use the IF formula

→ Example: =IF(J2=1, K2, "")

(You will need to adapt the cell range to your own dataset)

3 – take average RT

3 - take the average RT for the 4 remaining trials for each orientation (2 trials with ‘G’, 2 trials with ‘R’)

→ You need to copy and paste

the sorted and filtered RTs

first

	H	I	J	K	L	M
	orientation	G0	G1	R0	R1	
	0	1.72578597	0.56137013	0.82083392	0.58520699	
	10	0.69618297	0.55469012	0.76849103	0.56699801	
	20	0.51830101	0.72885799	0.77345395	0.57393289	
	30	0.81714988	0.5510571	0.91346812	0.77315188	
	40	1.03856778	0.50022101	0.75139117	0.88416696	
	50	0.66359711	0.69005609	0.6361351	0.66088295	
	60		0.69746685	0.725842	0.87150192	
	70	0.71920109	0.84289098	0.75844908	0.55095196	
	80	0.60485721	1.16597509	1.20264792	0.81737995	
	90	0.58619618	0.67837596	0.71961403	0.78602505	
	100	0.95092797	0.60148192	0.59503818	0.724154	
	110	0.75014401	0.99400687	1.0420711	0.9680512	
	120	1.26841402	0.93558908	1.131598	0.77219892	
	130	0.68548989	1.03460884	0.72103787	0.66855621	
	140	0.57426286	0.75173092	1.0549829	0.63321281	
	150	1.15089202	0.730443	1.01375604	1.46022821	
	160	1.37788892	1.6501689	0.7520771	0.78482199	
	170	1.33451986	1.08533907	0.86181498	0.93444896	
	180		1.56625199		1.85294199	

4 – correlate RT with orientation

4- correlate this average RT with the orientation of the stimulus

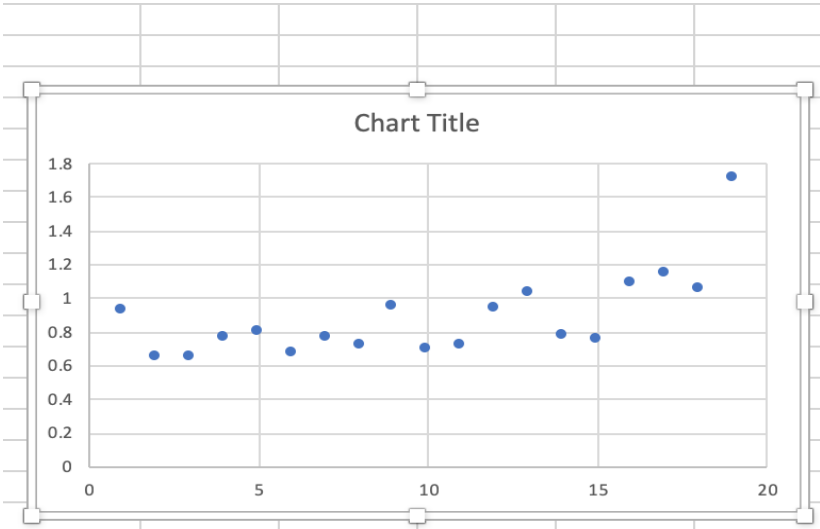
→ Use the CORREL formula

→ Example: =CORREL(Q2:Q20,R2:R20)

(You will need to adapt the cell range to your own dataset)

5 – insert graph

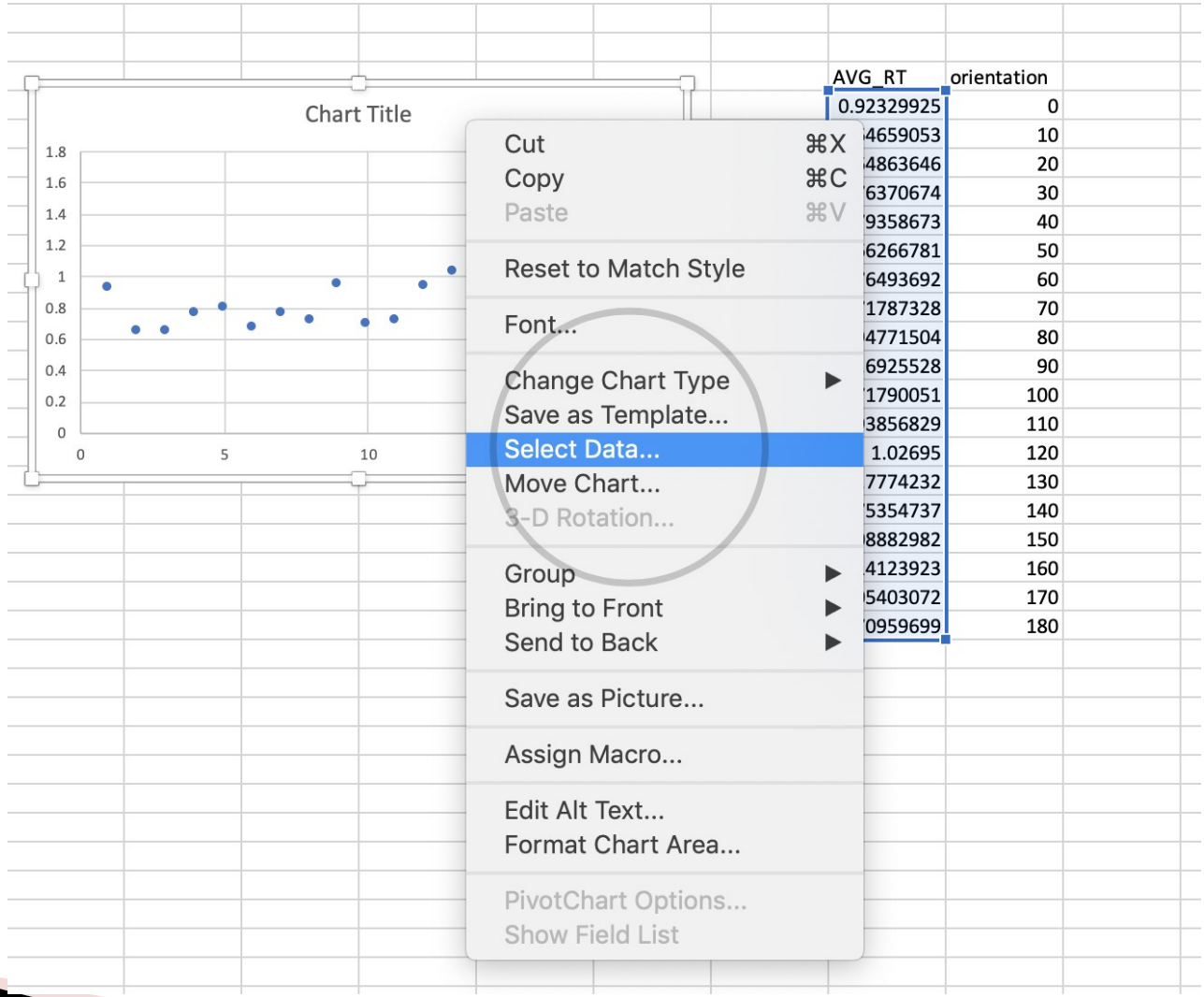
5- insert graph of x-y scatter → follow video



AVG_RT	orientation
0.92329925	0
0.64659053	10
0.64863646	20
0.76370674	30
0.79358673	40
0.66266781	50
0.76493692	60
0.71787328	70
0.94771504	80
0.6925528	90
0.71790051	100
0.93856829	110
1.02695	120
0.7774232	130
0.75354737	140
1.08882982	150
1.14123923	160
1.05403072	170
1.70959699	180

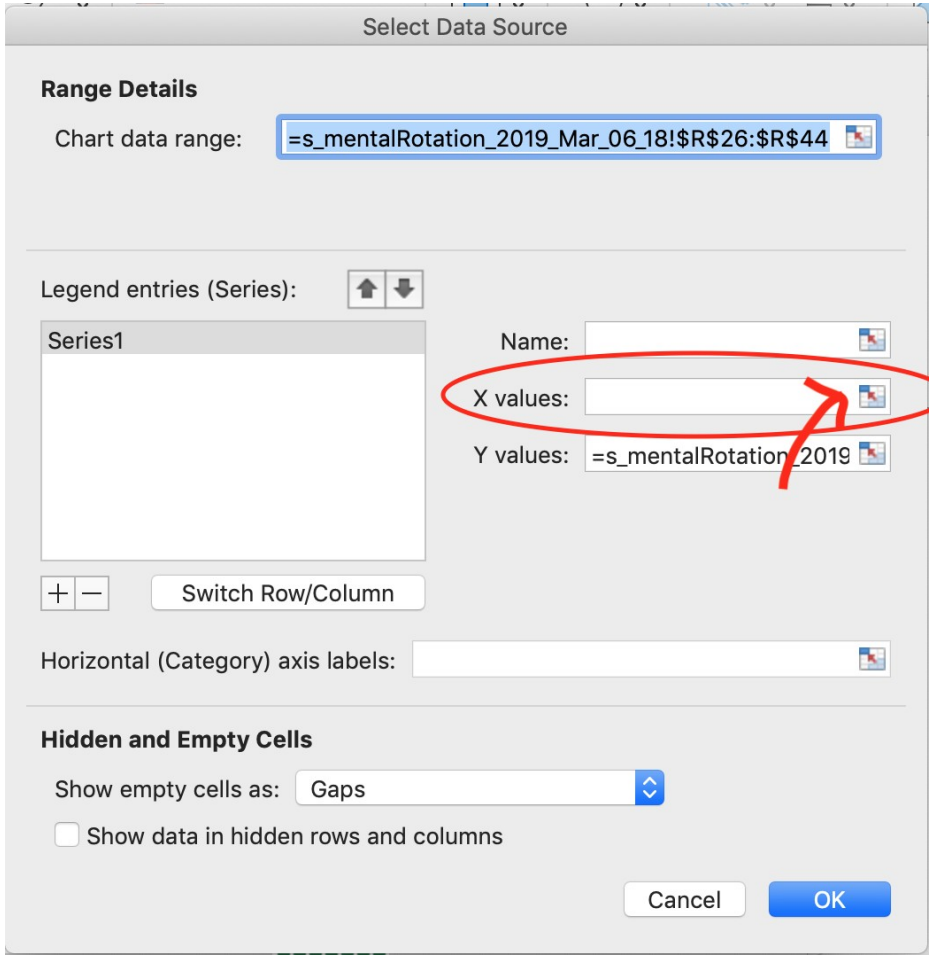
Select the **values only**; go to ”Insert” and choose a x-y scatter (no line for now – only the points)

5 – insert graph

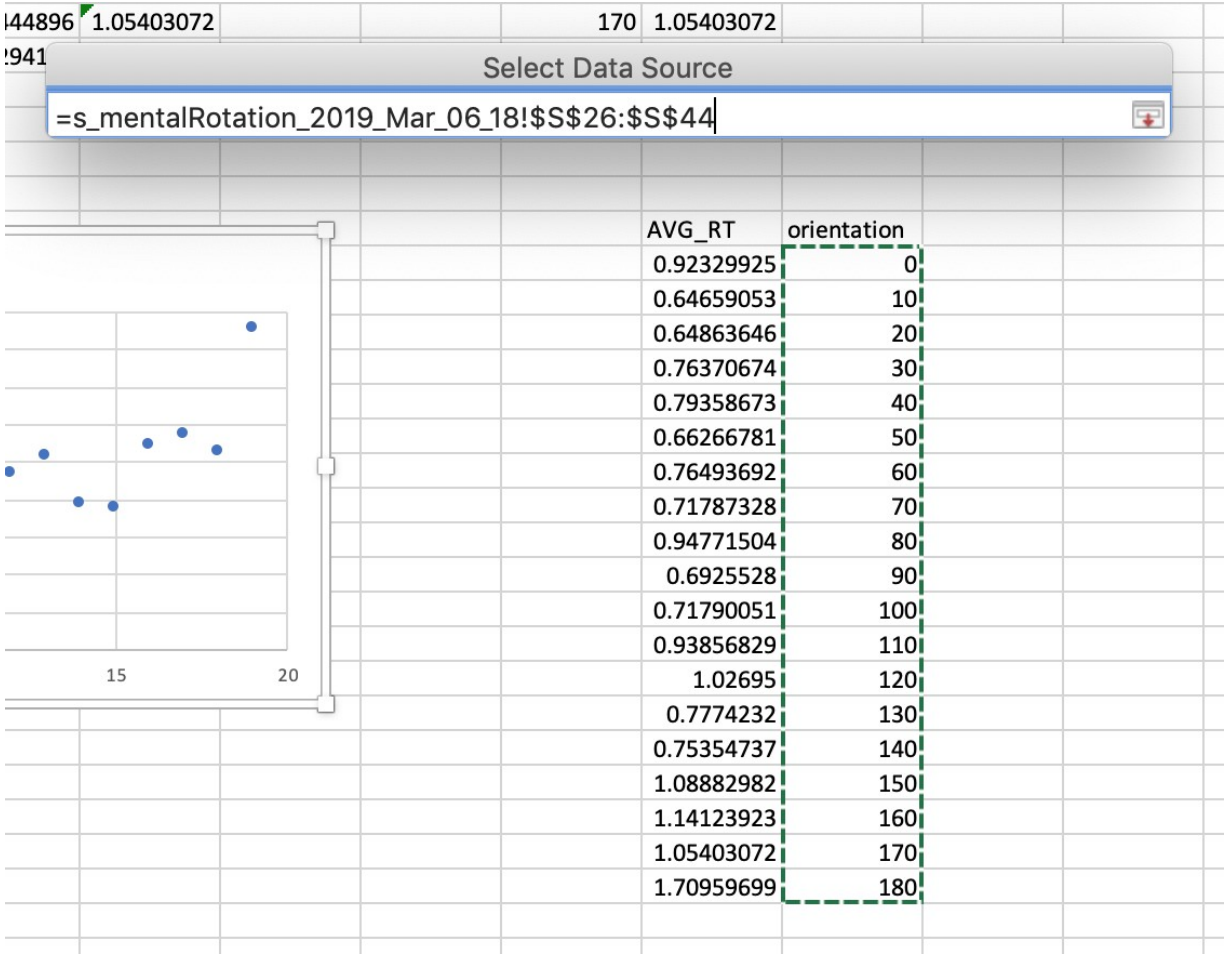


Right-click on the chart to access the menu

5 – insert graph



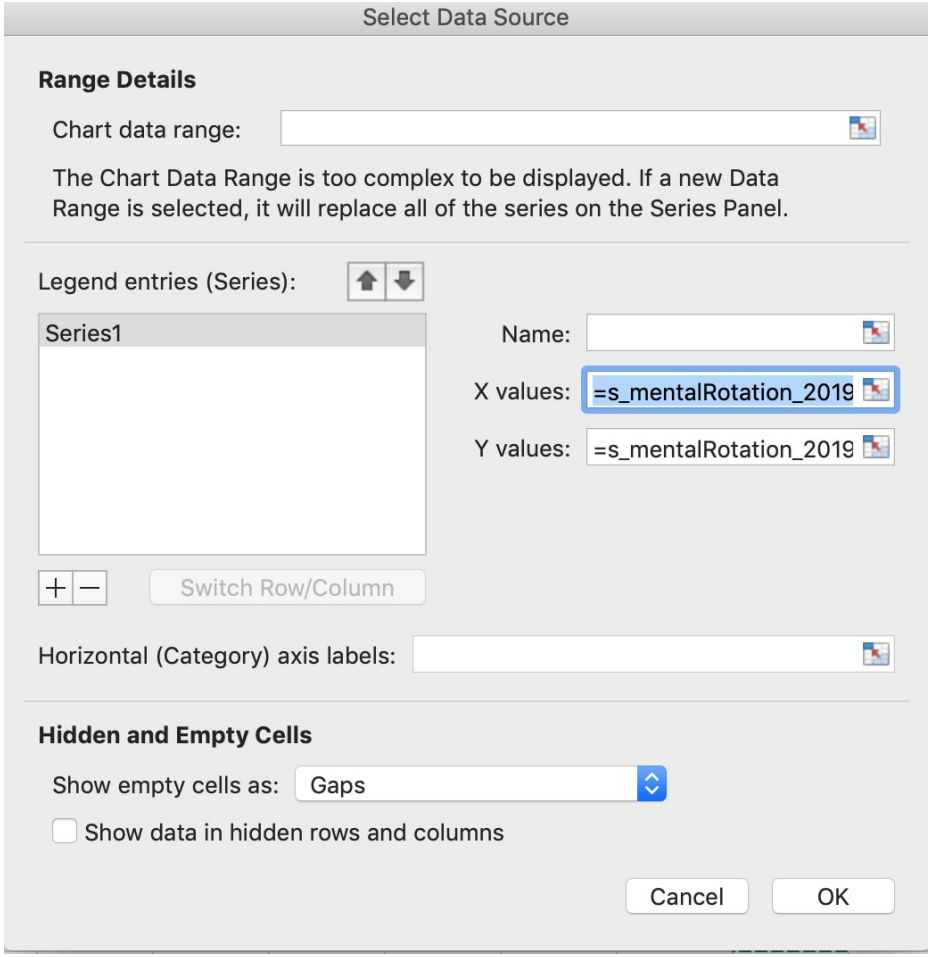
5 – insert graph



AVG_RT	orientation
0.92329925	0
0.64659053	10
0.64863646	20
0.76370674	30
0.79358673	40
0.66266781	50
0.76493692	60
0.71787328	70
0.94771504	80
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0.71790051	100
0.93856829	110
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0.7774232	130
0.75354737	140
1.08882982	150
1.14123923	160
1.05403072	170
1.70959699	180

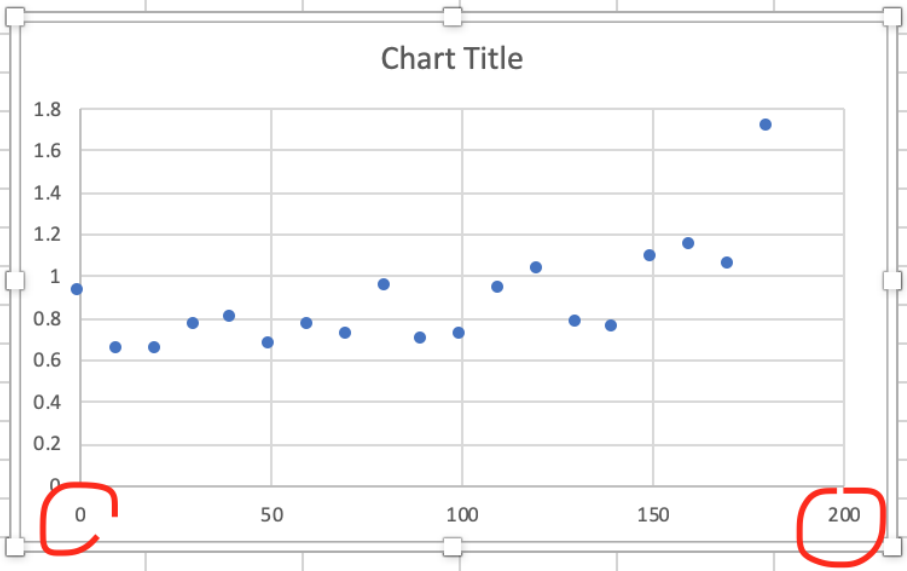
Press enter

5 – insert graph



Press OK

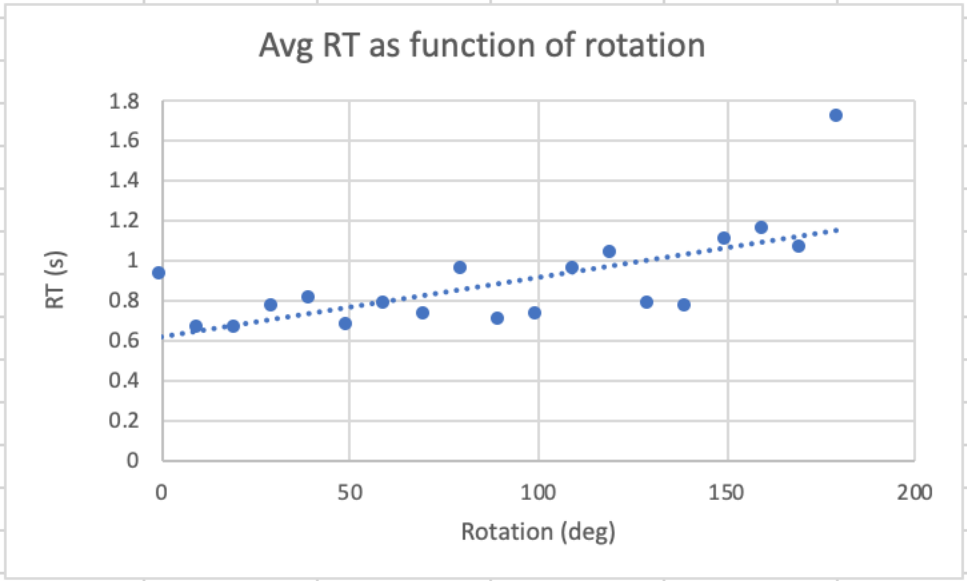
5 – insert graph



AVG_RT	orientation
0.92329925	0
0.64659053	10
0.64863646	20
0.76370674	30
0.79358673	40
0.66266781	50
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0.71787328	70
0.94771504	80
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0.93856829	110
1.02695	120
0.7774232	130
0.75354737	140
1.08882982	150
1.14123923	160
1.05403072	170
1.70959699	180

Note the change in scale
Add title and axis titles

Excel analysis: end result



AVG_RT	orientation
0.92329925	0
0.64659053	10
0.64863646	20
0.76370674	30
0.79358673	40
0.66266781	50
0.76493692	60
0.71787328	70
0.94771504	80
0.6925528	90
0.71790051	100
0.93856829	110
1.02695	120
0.7774232	130
0.75354737	140
1.08882982	150
1.14123923	160
1.05403072	170
1.70959699	180

Group analysis

If, on average, there is no (straight line) relationship between orientation and RT, then on average *r* will be 0

To test if *r* is, on average, different from 0 we can perform a *one-sample t-test* comparing *r* with 0

This would be a between-subjects analysis. That is, one needs the data from more than one subject to perform it. Once I will have received your datasets I will compile the values of r in one spreadsheet – we will do this analysis next week

Introduction

How to write an Introduction

This week we will write an introduction to the Mental Rotation study.

An introduction is a little like writing an essay

It should try to answer the following questions:

- →**Broadly introduce the area you are investigating**. You may need some definitions
- →What has been done in this area of psychology before? In other words, **review the current literature** (theories/findings) about the topic you are investigating. Are their any inconsistencies/problems in the research so far?
- →What was the point/purpose of your study?

Introduction

- **State your hypothesis** explicitly (but informally) towards the end of your introduction. This often means making reference to the IV(s) & DV (but informally)
  - E.g. 'This study looks at whether the amount of alcohol drunk and the gender of the consumer has an effect on the attractiveness of the mate selected.'
- **What do you expect** or predict may happen? If you have an expectation then say so.
  - E.g. 'Based on previous research discussed earlier, it is predicted that attractiveness ratings will increase as alcohol amount increases, but only for males. Attractiveness ratings made by female participants are not expected to be influenced by alcohol consumption.'

Introduction – Providing a rationale

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Possible reasons/rationale for a study

- → To support/test a specific theory/idea
- → To replicate/confirm an existing finding
  - → A replication with a different sample
- → To extend the findings of previous research
  - → Often a replication with a change in method
    - → State what differences are between your study and an existing study
- → To distinguish between different theories or resolve an anomaly (e.g. Contradictory results from previous studies)
- → To plug as gap in existing knowledge

The introduction doesn't need a separate heading

TIP: Do not state the null hypothesis in the introduction. You can assume that the reader knows what a null hypothesis is.

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Finding journal articles

There are many places you can search for journal articles:

- from the references given in the text book or review article
- Google scholar (like google but gives for academic papers):

  https://scholar.google.com/
- pubmed (more biological, good for neuroscience): https://www.ncbi.nlm.nih.gov/pubmed/
- PsycINFO (but requires several steps to authenticate when off campus) https://www.apa.org/pubs/databases/psycinfo/index

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Finding journal articles

You can also check these two journals for papers related to your topic:

Current opinion in Psychology

https://www.journals.elsevier.com/current-opinion-in-psychology

Current Opinion in Behavioral Sciences

https://www.journals.elsevier.com/current-opinion-in-behavioral-sciences

Why?

They have annotated bibliographies.

Extra slides on how to write an Introduction

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The following slides come from the presentation “Basics of Scientific Writing”, available on Sakai

General Guidelines

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- **Audience**

When writing a scientific paper, you need to write as though the reader knows nothing about the topic.

Pretend you're taking a Social Psychology class, and your instructor is curious about what experiments cognitive psychologists are doing. This instructor asks to read the paper about your project to learn about what you're doing.

The Social Psychology instructor is a scientist, so you don't need to write for a layperson, but does not know the specifics about the field.

Introduction

RUTGERS

Purpose of the introduction section

The introduction is arguably the most crucial section of a report because it sets the stage for the entire experiment. In this section the reader learns the story behind your experiment: what happened before you came along, what question has yet to be answered, and how you intend to answer it. A good introduction has the following elements:

Research topic: the topic you're interested in

Background: the literature review

Hypothesis: The problem you're addressing

Brief description the experiment: How you intend to address the problem

Introduction

RUTGERS

Research topic

Before you start explaining what you're doing, you need to gradually draw the reader in by acquainting them with the broader research topic.

> Let's say your experiment was about the way people categorize furniture. You might have a brilliant experiment that could decide whether the function of the furniture or the room the furniture appears in is more important. If you want someone to read and understand your paper, you need to give them a reason to be interested in categorization to begin with. Why does the way we categorize things matter?

A common approach to this is to give an example that most people would be familiar with from everyday life. You did something similar when we learned about pitch discrimination!

Introduction

RUTGERS

Background

Before you talk about your experiment specifically, you need to explain the related work that other scientists did before you. In addition to setting the stage for your experiment, you also need to give them credit for their ideas. You may have come up with a hypothesis, but scientific thinking doesn't happen in a vacuum. That means you learned about a topic that interested you, and then you decided you wanted to learn more. You can't assume the reader has learned the same thing, or interpreted it in the same way you did. You need to explain your perspective to the reader as if they know nothing about it so that everyone is on the same page.

The background should answer these questions:

1. What do we know already? This includes similar experiments that your experiment may be based on.
2. Is there disagreement in the field over the topic?

Introduction

RUTGERS

Background

When writing the background, be careful not to make claims without backing them up with evidence!

For example, if you say something like "Previous studies on categorization suggest that category membership is not discrete", you need to cite work that has actually made that claim (for this example, Rosch, 1978). Making sure we have evidence to back up our claims is what separates science from opinion.

Introduction

RUTGERS

Background

To give someone credit for an idea, include the **last name(s) of the author(s)** and the year of the publication.

Example: Previous work suggests category membership is not discrete (Rosch, 1978).

> This refers to a paper called *Principles of categorization* written by Eleanor Rosch. But we don't need all that information to correctly identify the paper. **Who** wrote the paper and **when** they wrote it is what matters.

Do not include the title of the paper! Nobody cares, and it just wastes space!

Introduction

RUTGERS

Hypothesis

This part is extremely important because it's where you need to state your theory and hypothesis. Doing so clearly and concisely is a challenge.

Start off by explaining what problem has yet to be solved (the one you *intend* to solve with your experiment). This will help transition from the background literature to the current study.

Start with the theory. This is how you think some aspect of cognition or perception works. For example, you might have a theory that we categorize furniture based on the function of the furniture and the room it is found in. Under that theory, a couch is living room furniture because we usually sit on couches in order to relax, and living rooms are used for recreation/relaxation. Your hypothesis to test this could be: furniture that is not usually associated with a living room or a kitchen would be categorized with one or the other based on its function. An alternative hypothesis, if your theory is not correct, is that ambiguous furniture would be arbitrarily assigned to one category or the other.

Introduction

RUTGERS

Brief description of the experiment

Now that the reader knows why you are doing your experiment and what the hypothesis is, the next thing you need to do is give a brief overview of the experiment. Don't go into too much detail, because that's what the method section is for.

First, give a general description of the experiment. What kind of task are you using? How is the task you're using an appropriate way to test the hypothesis? Define the independent variable(s) and the dependent variable(s). The **independent variable** is anything that you manipulate in order to test the hypothesis. These are often identified by conditions (e.g., word-color congruence for the stroop task). The **dependent variable** is what you are measuring. This could be percent correct, reaction time, etc.

Introduction

RUTGERS

Brief description of the experiment

The last thing you need to do before the method section is state your predictions in terms of the variables. For example, two slides above we introduced the (made up) hypotheses that 1) ambiguous furniture would be categorized based on its function or 2) ambiguous furniture would be categorized arbitrarily.

Let's say you run a decision experiment where participants are shown images of unfamiliar furniture and are asked to group it with either living room furniture or kitchen furniture, and they do this by pressing one key to decide *living room* and another key to decide *kitchen*. The prediction for hypothesis 1 would be that furniture that appears more comfortable and/or entertaining should be assigned to the living room more frequently, and more quickly. The prediction for hypothesis 2 would be that unfamiliar furniture should be assigned equally often to either furniture category. By stating the predictions and connecting them to the hypothesis, the meaning of the results of the experiment will be easier for the reader to understand.

Introduction

RUTGERS

RULE OF THUMB: The shape of the Introduction

You might want to think of the Introduction as the upper part of an hourglass. You should start writing about the broad stuff (research topic and background) and then narrow things down to your specific hypothesis and experimental approach.



Introduction

Methods

Results

Discussion

Introduction

RUTGERS

RULE OF THUMB: The shape of the Introduction

(tip: a nice way to introduce the “Research topic” is to narrate a personal anecdote)



- Research topic

- Background

- Hypothesis

- Brief description the experiment