Practical approaches to experimental design

Practical approaches to experimental design

- A lot of young researchers (esp. those without programming experience or training) treat the experiment as a whole

- Trial structure is built into the experimental interface

Practical approaches to experimental design

An alternative:

- Trial structure and experimental interface are coded separately

- Trials for a participant are defined in advance – noting everything the participant will see

- Programme for experimental interface reads in generated trials for a participant to run the experiment

Practical approaches to experimental design

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- Trial structure and experimental interface are coded separately

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This is the approach we're going to take.

What do you mean 'trial structure'?

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We're going to script the procedure of the experiment, before it is fed into the programme itself.

e.g. For a single trial, we know we want participants to see 2 main stims from the target domain

What do you mean 'trial structure'?

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e.g. We will randomly select 2/5 Spice Girls

What do you mean 'trial structure'?

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What do you mean 'trial structure'?

e.g. Position of each Spice Girl is randomised on the screen

What do you mean 'trial structure'?

e.g. Position of each Spice Girl is randomised on the screen

What do you mean 'trial structure'?

We want to keep track, at each trial, of:

- Which Spice Girls have been picked
- Which Spice Girl was on the left, which on the right

+ other info like participant Id, trial number etc.

What do you mean 'trial structure'?

ParticipantId	Trial_num	Spice_left	Spice_right
spice1	1	sporty	scary
spice1	2	baby	sporty
spice1	3	posh	ginger
spice1	4	posh	baby
spice1	5	scary	ginger

What do you mean 'trial structure'?

ParticipantId	Trial_num	Spice_left	Spice_right
spice1	1	sporty	scary
spice1	2	baby	sporty
spice1	3	posh	ginger
spice1	4	posh	baby
spice1	5	scary	ginger

All variables you need for analysis – but not reliant on the participants' output.

2 approaches

2 approaches

The 'holistic' approach

- You can still keep track of trial structure

- Trial structure is generated at the same time as the experiment

- Trial structure can be saved in csv/excel format for later reference

2 approaches

The 'separatist' approach (our approach):

- Code trial structure and main experiment in different stages

- Trial structure for a participant is generated before they do the experiment

- Trial structure is generated as a csv/excel file where each row is a trial in the

  experiment

- The experiment programme reads in each row and feeds in stim info etc. to produce

  interface

Why separate?

1. Neater scripts!

2. Clearer train of thought – less likely to forget to record an important variable

3. Easier to check for errors

4. Easier to test experimental interface

5. Can use across multiple platforms

In this session

We will:

- Discuss what pre-experiment information we want to record

- Go through a script that generates trial structures for participants in the experiment
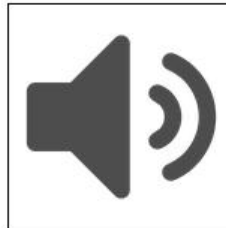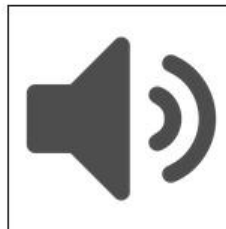
In this session

We will:

- Discuss what pre-experiment information we want to record

- Go through a script that generates trial structures for participants in the experiment

We'll do this using iPython and Jupyter notebooks
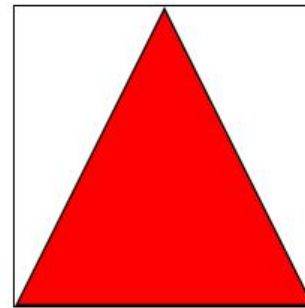
Our experiment

Our experiment
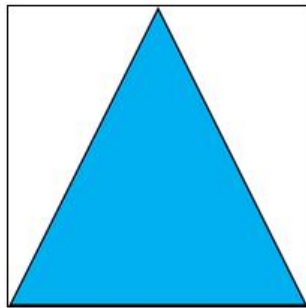
Our experiment

Tokens from target domain
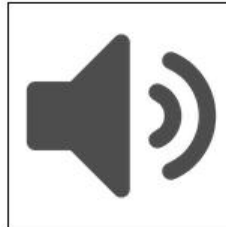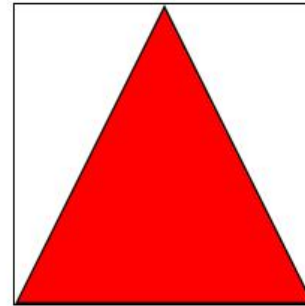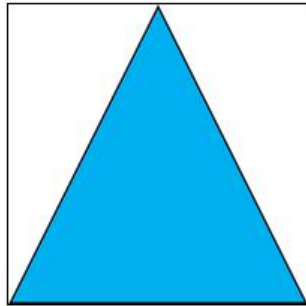
Our experiment

INDUCERS
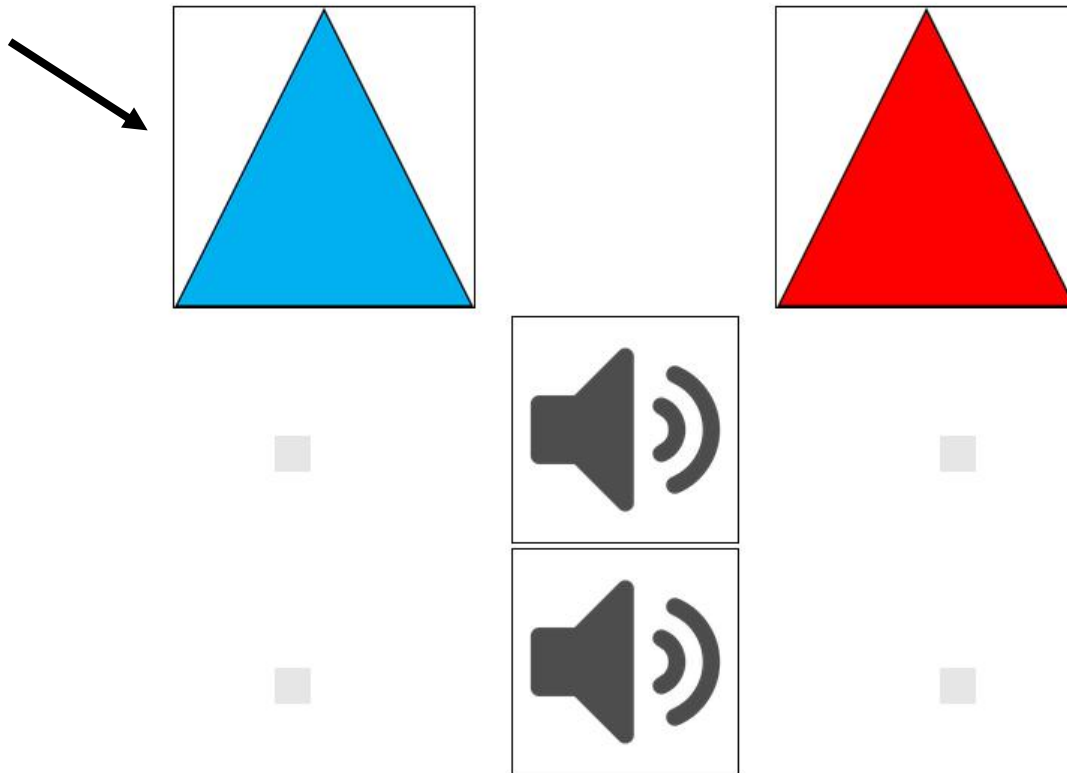
Submit Answers

Our experiment
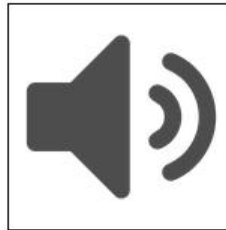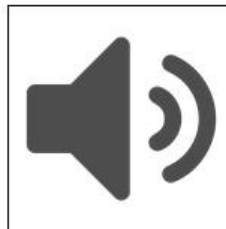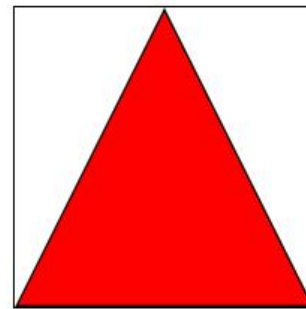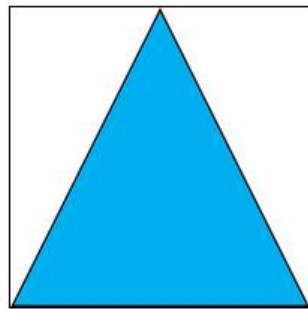
Tokens to match to targets

Our experiment

CONCURRENTS

Submit Answers

Our experiment
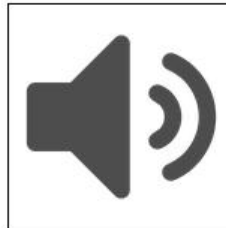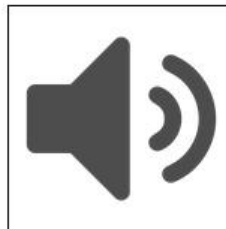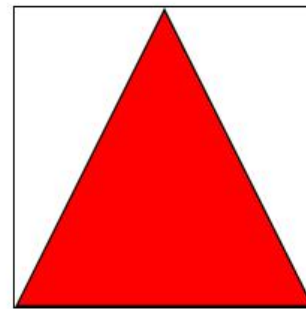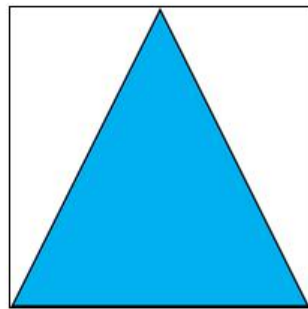
Selection boxes

Submit Answers

Our experiment
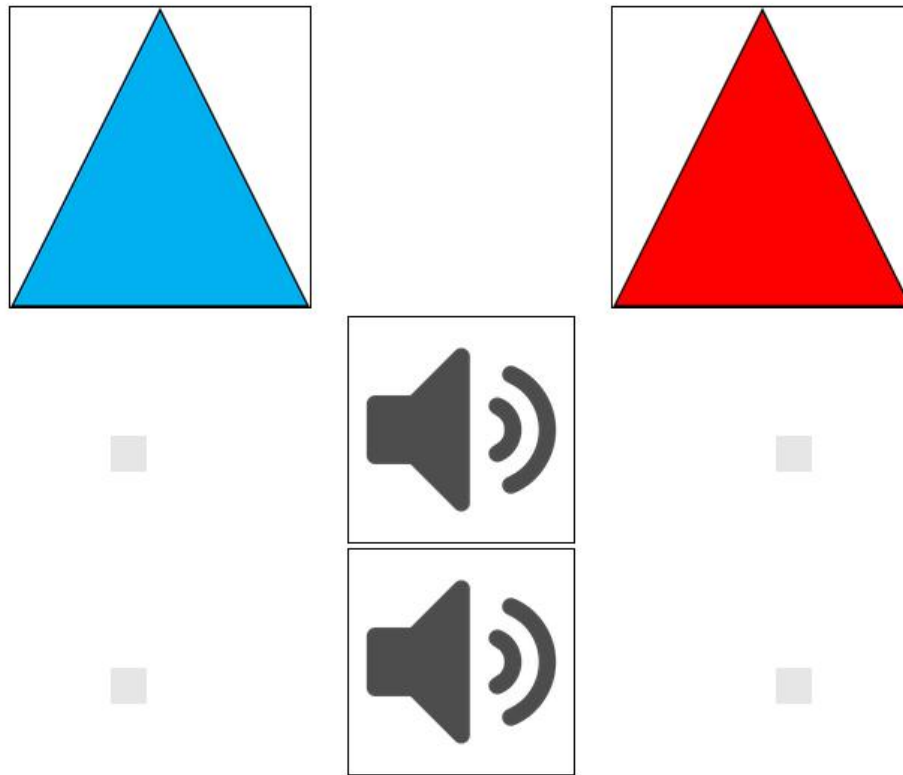
Participant's choice the only dependent output

To record in trial structure:

- Target stimuli

- Position of targets

- Stimuli to match to targets

- Position of match stimuli

To record in trial structure:

- Target stimuli

- Position of targets

- Stimuli to match to targets

- Position of match stimuli

- Participant ID

- Trial number

- Condition

To record in trial structure

ParticipantId - write as condition + number

Condition – each condition a group of 3 target domains

e.g. amp, size, speed

To record in trial structure

Position of targets - EASY! Left or right

To record in trial structure

Target stims/matching stims – a bit more tricky

What information do we need to record about the target stims?

To record in trial structure

Target stims/matching stims – a bit more tricky

What information do we need to record about the target stims?

Domain: brightness, pitch, amplitude

Set (within-domain category):   e.g. pitch → sung, sine, whistle

Value: low or high (L/H)

all this information gives us a **token** name

Id	TrialNum	Focal1	Focal2	Focal3	Inducer	Concurrent	InducerL	InducerR	ConcurrentL	ConcurrentR
Amp-Size-Speed-1	0	Amp	Size	Speed	Shape	Amp	Shape-BK4-H	Shape-BK4-L	Amp-Piano-H	Amp-Piano-L
Amp-Size-Speed-1	1	Amp	Size	Speed	Brightness	Speed	Brightness-Squares-H	Brightness-Squares-L	Speed-SP2-L	Speed-SP2-H
Amp-Size-Speed-1	2	Amp	Size	Speed	Size	Shape	Size-Diamonds-H	Size-Diamonds-L	Shape-BK4-H	Shape-BK4-L
Amp-Size-Speed-1	3	Amp	Size	Speed	Size	Amp	Size-Squares-H	Size-Squares-L	Amp-Sung-L	Amp-Sung-H
Amp-Size-Speed-1	4	Amp	Size	Speed	Affect	Amp	Affect-PD-L	Affect-PD-H	Amp-Piano-L	Amp-Piano-H
Amp-Size-Speed-1	5	Amp	Size	Speed	Amp	Brightness	Amp-Sine-L	Amp-Sine-H	Brightness-Squares-L	Brightness-Squares-H
Amp-Size-Speed-1	6	Amp	Size	Speed	Pitch	Size	Pitch-Piano-H	Pitch-Piano-L	Size-Triangles-L	Size-Triangles-H
Amp-Size-Speed-1	7	Amp	Size	Speed	Amp	Size	Amp-Sung-L	Amp-Sung-H	Size-Triangles-L	Size-Triangles-H
Amp-Size-Speed-1	8	Amp	Size	Speed	Size	Amp	Size-Squares-H	Size-Squares-L	Amp-Piano-L	Amp-Piano-H
Amp-Size-Speed-1	9	Amp	Size	Speed	Affect	Size	Affect-PD-H	Affect-PD-L	Size-Circles-H	Size-Circles-L
Amp-Size-Speed-1	10	Amp	Size	Speed	Speed	Pitch	Speed-SP3-L	Speed-SP3-H	Pitch-Piano-H	Pitch-Piano-L
Amp-Size-Speed-1	11	Amp	Size	Speed	Amp	Speed	Amp-Sung-L	Amp-Sung-H	Speed-SP2-H	Speed-SP2-L
Amp-Size-Speed-1	12	Amp	Size	Speed	Speed	Amp	Speed-SP4-H	Speed-SP4-L	Amp-Sung-L	Amp-Sung-H
Amp-Size-Speed-1	13	Amp	Size	Speed	Speed	Brightness	Speed-SP4-L	Speed-SP4-H	Brightness-Squares-L	Brightness-Squares-H
Amp-Size-Speed-1	14	Amp	Size	Speed	Amp	Pitch	Amp-Whistle-L	Amp-Whistle-H	Pitch-Piano-H	Pitch-Piano-L
Amp-Size-Speed-1	15	Amp	Size	Speed	Pitch	Size	Pitch-Piano-L	Pitch-Piano-H	Size-Circles-L	Size-Circles-H
Amp-Size-Speed-1	16	Amp	Size	Speed	Affect	Amp	Affect-PD-L	Affect-PD-H	Amp-Sung-L	Amp-Sung-H

Id	TrialNum	Focal1	Focal2	Focal3	Inducer	Concurrent	InducerL	InducerR	ConcurrentL	ConcurrentR
Amp-Size-Speed-1	0	Amp	Size	Speed	Shape	Amp	Shape-BK4-H	Shape-BK4-L	Amp-Piano-H	Amp-Piano-L
Amp-Size-Speed-1	1	Amp	Size	Speed	Brightness	Speed	Brightness-Squares-H	Brightness-Squares-L	Speed-SP2-L	Speed-SP2-H
Amp-Size-Speed-1	2	Amp	Size	Speed	Size	Shape	Size-Diamonds-H	Size-Diamonds-L	Shape-BK4-H	Shape-BK4-L
Amp-Size-Speed-1	3	Amp	Size	Speed	Size	Amp	Size-Squares-H	Size-Squares-L	Amp-Sung-L	Amp-Sung-H
Amp-Size-Speed-1	4	Amp	Size	Speed	Affect	Amp	Affect-PD-L	Affect-PD-H	Amp-Piano-L	Amp-Piano-H
Amp-Size-Speed-1	5	Amp	Size	Speed	Amp	Brightness	Amp-Sine-L	Amp-Sine-H	Brightness-Squares-L	Brightness-Squares-H
Amp-Size-Speed-1	6	Amp	Size	Speed	Pitch	Size	Pitch-Piano-H	Pitch-Piano-L	Size-Triangles-L	Size-Triangles-H
Amp-Size-Speed-1	7	Amp	Size	Speed	Amp	Size	Amp-Sung-L	Amp-Sung-H	Size-Triangles-L	Size-Triangles-H
Amp-Size-Speed-1	8	Amp	Size	Speed	Size	Amp	Size-Squares-H	Size-Squares-L	Amp-Piano-L	Amp-Piano-H
Amp-Size-Speed-1	9	Amp	Size	Speed	Affect	Size	Affect-PD-H	Affect-PD-L	Size-Circles-H	Size-Circles-L
Amp-Size-Speed-1	10	Amp	Size	Speed	Speed	Pitch	Speed-SP3-L	Speed-SP3-H	Pitch-Piano-H	Pitch-Piano-L
Amp-Size-Speed-1	11	Amp	Size	Speed	Amp	Speed	Amp-Sung-L	Amp-Sung-H	Speed-SP2-H	Speed-SP2-L
Amp-Size-Speed-1	12	Amp	Size	Speed	Speed	Amp	Speed-SP4-H	Speed-SP4-L	Amp-Sung-L	Amp-Sung-H
Amp-Size-Speed-1	13	Amp	Size	Speed	Speed	Brightness	Speed-SP4-L	Speed-SP4-H	Brightness-Squares-L	Brightness-Squares-H
Amp-Size-Speed-1	14	Amp	Size	Speed	Amp	Pitch	Amp-Whistle-L	Amp-Whistle-H	Pitch-Piano-H	Pitch-Piano-L
Amp-Size-Speed-1	15	Amp	Size	Speed	Pitch	Size	Pitch-Piano-L	Pitch-Piano-H	Size-Circles-L	Size-Circles-H
Amp-Size-Speed-1	16	Amp	Size	Speed	Affect	Amp	Affect-PD-L	Affect-PD-H	Amp-Sung-L	Amp-Sung-H

Participant id:

Condition + number

Condition is [amp, size, speed]

Id	TrialNum	Focal1	Focal2	Focal3	Inducer	Concurrent	InducerL	InducerR	ConcurrentL	ConcurrentR
Amp-Size-Speed-1	0	Amp	Size	Speed	Shape	Amp	Shape-BK4-H	Shape-BK4-L	Amp-Piano-H	Amp-Piano-L
Amp-Size-Speed-1	1	Amp	Size	Speed	Brightness	Speed	Brightness-Squares-H	Brightness-Squares-L	Speed-SP2-L	Speed-SP2-H
Amp-Size-Speed-1	2	Amp	Size	Speed	Size	Shape	Size-Diamonds-H	Size-Diamonds-L	Shape-BK4-H	Shape-BK4-L
Amp-Size-Speed-1	3	Amp	Size	Speed	Size	Amp	Size-Squares-H	Size-Squares-L	Amp-Sung-L	Amp-Sung-H
Amp-Size-Speed-1	4	Amp	Size	Speed	Affect	Amp	Affect-PD-L	Affect-PD-H	Amp-Piano-L	Amp-Piano-H
Amp-Size-Speed-1	5	Amp	Size	Speed	Amp	Brightness	Amp-Sine-L	Amp-Sine-H	Brightness-Squares-L	Brightness-Squares-H
Amp-Size-Speed-1	6	Amp	Size	Speed	Pitch	Size	Pitch-Piano-H	Pitch-Piano-L	Size-Triangles-L	Size-Triangles-H
Amp-Size-Speed-1	7	Amp	Size	Speed	Amp	Size	Amp-Sung-L	Amp-Sung-H	Size-Triangles-L	Size-Triangles-H
Amp-Size-Speed-1	8	Amp	Size	Speed	Size	Amp	Size-Squares-H	Size-Squares-L	Amp-Piano-L	Amp-Piano-H
Amp-Size-Speed-1	9	Amp	Size	Speed	Affect	Size	Affect-PD-H	Affect-PD-L	Size-Circles-H	Size-Circles-L
Amp-Size-Speed-1	10	Amp	Size	Speed	Speed	Pitch	Speed-SP3-L	Speed-SP3-H	Pitch-Piano-H	Pitch-Piano-L
Amp-Size-Speed-1	11	Amp	Size	Speed	Amp	Speed	Amp-Sung-L	Amp-Sung-H	Speed-SP2-H	Speed-SP2-L
Amp-Size-Speed-1	12	Amp	Size	Speed	Speed	Amp	Speed-SP4-H	Speed-SP4-L	Amp-Sung-L	Amp-Sung-H
Amp-Size-Speed-1	13	Amp	Size	Speed	Speed	Brightness	Speed-SP4-L	Speed-SP4-H	Brightness-Squares-L	Brightness-Squares-H
Amp-Size-Speed-1	14	Amp	Size	Speed	Amp	Pitch	Amp-Whistle-L	Amp-Whistle-H	Pitch-Piano-H	Pitch-Piano-L
Amp-Size-Speed-1	15	Amp	Size	Speed	Pitch	Size	Pitch-Piano-L	Pitch-Piano-H	Size-Circles-L	Size-Circles-H
Amp-Size-Speed-1	16	Amp	Size	Speed	Affect	Amp	Affect-PD-L	Affect-PD-H	Amp-Sung-L	Amp-Sung-H

Condition

Noted as 3 'focal' or target domains

i.e. the domains we test matches to

Id	TrialNum	Focal1	Focal2	Focal3	Inducer	Concurrent	InducerL	InducerR	ConcurrentL	ConcurrentR
Amp-Size-Speed-1	0	Amp	Size	Speed	Shape	Amp	Shape-BK4-H	Shape-BK4-L	Amp-Piano-H	Amp-Piano-L
Amp-Size-Speed-1	1	Amp	Size	Speed	Brightness	Speed	Brightness-Squares-H	Brightness-Squares-L	Speed-SP2-L	Speed-SP2-H
Amp-Size-Speed-1	2	Amp	Size	Speed	Size	Shape	Size-Diamonds-H	Size-Diamonds-L	Shape-BK4-H	Shape-BK4-L
Amp-Size-Speed-1	3	Amp	Size	Speed	Size	Amp	Size-Squares-H	Size-Squares-L	Amp-Sung-L	Amp-Sung-H
Amp-Size-Speed-1	4	Amp	Size	Speed	Affect	Amp	Affect-PD-L	Affect-PD-H	Amp-Piano-L	Amp-Piano-H
Amp-Size-Speed-1	5	Amp	Size	Speed	Amp	Brightness	Amp-Sine-L	Amp-Sine-H	Brightness-Squares-L	Brightness-Squares-H
Amp-Size-Speed-1	6	Amp	Size	Speed	Pitch	Size	Pitch-Piano-H	Pitch-Piano-L	Size-Triangles-L	Size-Triangles-H
Amp-Size-Speed-1	7	Amp	Size	Speed	Amp	Size	Amp-Sung-L	Amp-Sung-H	Size-Triangles-L	Size-Triangles-H
Amp-Size-Speed-1	8	Amp	Size	Speed	Size	Amp	Size-Squares-H	Size-Squares-L	Amp-Piano-L	Amp-Piano-H
Amp-Size-Speed-1	9	Amp	Size	Speed	Affect	Size	Affect-PD-H	Affect-PD-L	Size-Circles-H	Size-Circles-L
Amp-Size-Speed-1	10	Amp	Size	Speed	Speed	Pitch	Speed-SP3-L	Speed-SP3-H	Pitch-Piano-H	Pitch-Piano-L
Amp-Size-Speed-1	11	Amp	Size	Speed	Amp	Speed	Amp-Sung-L	Amp-Sung-H	Speed-SP2-H	Speed-SP2-L
Amp-Size-Speed-1	12	Amp	Size	Speed	Speed	Amp	Speed-SP4-H	Speed-SP4-L	Amp-Sung-L	Amp-Sung-H
Amp-Size-Speed-1	13	Amp	Size	Speed	Speed	Brightness	Speed-SP4-L	Speed-SP4-H	Brightness-Squares-L	Brightness-Squares-H
Amp-Size-Speed-1	14	Amp	Size	Speed	Amp	Pitch	Amp-Whistle-L	Amp-Whistle-H	Pitch-Piano-H	Pitch-Piano-L
Amp-Size-Speed-1	15	Amp	Size	Speed	Pitch	Size	Pitch-Piano-L	Pitch-Piano-H	Size-Circles-L	Size-Circles-H
Amp-Size-Speed-1	16	Amp	Size	Speed	Affect	Amp	Affect-PD-L	Affect-PD-H	Amp-Sung-L	Amp-Sung-H

Trial number

Notes each round in the experiment

Allows experiment programme to read this
as a procedure, and track procedure

Id	TrialNum	Focal1	Focal2	Focal3	Inducer	Concurrent	InducerL	InducerR	ConcurrentL	ConcurrentR
Amp-Size-Speed-1	0	Amp	Size	Speed	Shape	Amp	Shape-BK4-H	Shape-BK4-L	Amp-Piano-H	Amp-Piano-L
Amp-Size-Speed-1	1	Amp	Size	Speed	Brightness	Speed	Brightness-Squares-H	Brightness-Squares-L	Speed-SP2-L	Speed-SP2-H
Amp-Size-Speed-1	2	Amp	Size	Speed	Size	Shape	Size-Diamonds-H	Size-Diamonds-L	Shape-BK4-H	Shape-BK4-L
Amp-Size-Speed-1	3	Amp	Size	Speed	Size	Amp	Size-Squares-H	Size-Squares-L	Amp-Sung-L	Amp-Sung-H
Amp-Size-Speed-1	4	Amp	Size	Speed	Affect	Amp	Affect-PD-L	Affect-PD-H	Amp-Piano-L	Amp-Piano-H
Amp-Size-Speed-1	5	Amp	Size	Speed	Amp	Brightness	Amp-Sine-L	Amp-Sine-H	Brightness-Squares-L	Brightness-Squares-H
Amp-Size-Speed-1	6	Amp	Size	Speed	Pitch	Size	Pitch-Piano-H	Pitch-Piano-L	Size-Triangles-L	Size-Triangles-H
Amp-Size-Speed-1	7	Amp	Size	Speed	Amp	Size	Amp-Sung-L	Amp-Sung-H	Size-Triangles-L	Size-Triangles-H
Amp-Size-Speed-1	8	Amp	Size	Speed	Size	Amp	Size-Squares-H	Size-Squares-L	Amp-Piano-L	Amp-Piano-H
Amp-Size-Speed-1	9	Amp	Size	Speed	Affect	Size	Affect-PD-H	Affect-PD-L	Size-Circles-H	Size-Circles-L
Amp-Size-Speed-1	10	Amp	Size	Speed	Speed	Pitch	Speed-SP3-L	Speed-SP3-H	Pitch-Piano-H	Pitch-Piano-L
Amp-Size-Speed-1	11	Amp	Size	Speed	Amp	Speed	Amp-Sung-L	Amp-Sung-H	Speed-SP2-H	Speed-SP2-L
Amp-Size-Speed-1	12	Amp	Size	Speed	Speed	Amp	Speed-SP4-H	Speed-SP4-L	Amp-Sung-L	Amp-Sung-H
Amp-Size-Speed-1	13	Amp	Size	Speed	Speed	Brightness	Speed-SP4-L	Speed-SP4-H	Brightness-Squares-L	Brightness-Squares-H
Amp-Size-Speed-1	14	Amp	Size	Speed	Amp	Pitch	Amp-Whistle-L	Amp-Whistle-H	Pitch-Piano-H	Pitch-Piano-L
Amp-Size-Speed-1	15	Amp	Size	Speed	Pitch	Size	Pitch-Piano-L	Pitch-Piano-H	Size-Circles-L	Size-Circles-H
Amp-Size-Speed-1	16	Amp	Size	Speed	Affect	Amp	Affect-PD-L	Affect-PD-H	Amp-Sung-L	Amp-Sung-H

THIS.

Id	TrialNum	Focal1	Focal2	Focal3	Inducer	Concurrent	InducerL	InducerR	ConcurrentL	ConcurrentR
Amp-Size-Speed-1	0	Amp	Size	Speed	Shape	Amp	Shape-BK4-H	Shape-BK4-L	Amp-Piano-H	Amp-Piano-L
Amp-Size-Speed-1	1	Amp	Size	Speed	Brightness	Speed	Brightness-Squares-H	Brightness-Squares-L	Speed-SP2-L	Speed-SP2-H
Amp-Size-Speed-1	2	Amp	Size	Speed	Size	Shape	Size-Diamonds-H	Size-Diamonds-L	Shape-BK4-H	Shape-BK4-L
Amp-Size-Speed-1	3	Amp	Size	Speed	Size	Amp	Size-Squares-H	Size-Squares-L	Amp-Sung-L	Amp-Sung-H
Amp-Size-Speed-1	4	Amp	Size	Speed	Affect	Amp	Affect-PD-L	Affect-PD-H	Amp-Piano-L	Amp-Piano-H
Amp-Size-Speed-1	5	Amp	Size	Speed	Amp	Brightness	Amp-Sine-L	Amp-Sine-H	Brightness-Squares-L	Brightness-Squares-H
Amp-Size-Speed-1	6	Amp	Size	Speed	Pitch	Size	Pitch-Piano-H	Pitch-Piano-L	Size-Triangles-L	Size-Triangles-H
Amp-Size-Speed-1	7	Amp	Size	Speed	Amp	Size	Amp-Sung-L	Amp-Sung-H	Size-Triangles-L	Size-Triangles-H
Amp-Size-Speed-1	8	Amp	Size	Speed	Size	Amp	Size-Squares-H	Size-Squares-L	Amp-Piano-L	Amp-Piano-H
Amp-Size-Speed-1	9	Amp	Size	Speed	Affect	Size	Affect-PD-H	Affect-PD-L	Size-Circles-H	Size-Circles-L
Amp-Size-Speed-1	10	Amp	Size	Speed	Speed	Pitch	Speed-SP3-L	Speed-SP3-H	Pitch-Piano-H	Pitch-Piano-L
Amp-Size-Speed-1	11	Amp	Size	Speed	Amp	Speed	Amp-Sung-L	Amp-Sung-H	Speed-SP2-H	Speed-SP2-L
Amp-Size-Speed-1	12	Amp	Size	Speed	Speed	Amp	Speed-SP4-H	Speed-SP4-L	Amp-Sung-L	Amp-Sung-H
Amp-Size-Speed-1	13	Amp	Size	Speed	Speed	Brightness	Speed-SP4-L	Speed-SP4-H	Brightness-Squares-L	Brightness-Squares-H
Amp-Size-Speed-1	14	Amp	Size	Speed	Amp	Pitch	Amp-Whistle-L	Amp-Whistle-H	Pitch-Piano-H	Pitch-Piano-L
Amp-Size-Speed-1	15	Amp	Size	Speed	Pitch	Size	Pitch-Piano-L	Pitch-Piano-H	Size-Circles-L	Size-Circles-H
Amp-Size-Speed-1	16	Amp	Size	Speed	Affect	Amp	Affect-PD-L	Affect-PD-H	Amp-Sung-L	Amp-Sung-H

Take one example

Brightness-Squares-H

Encodes info about stimulus item:

Domain:	Brightness
Category:	Square
Value:	H (high) → high brightness

Id	TrialNum	Focal1	Focal2	Focal3	Inducer	Concurrent	InducerL	InducerR	ConcurrentL	ConcurrentR
Amp-Size-Speed-1	0	Amp	Size	Speed	Shape	Amp	Shape-BK4-H	Shape-BK4-L	Amp-Piano-H	Amp-Piano-L
Amp-Size-Speed-1	1	Amp	Size	Speed	Brightness	Speed	Brightness-Squares-H	Brightness-Squares-L	Speed-SP2-L	Speed-SP2-H
Amp-Size-Speed-1	2	Amp	Size	Speed	Size	Shape	Size-Diamonds-H	Size-Diamonds-L	Shape-BK4-H	Shape-BK4-L
Amp-Size-Speed-1	3	Amp	Size	Speed	Size	Amp	Size-Squares-H	Size-Squares-L	Amp-Sung-L	Amp-Sung-H
Amp-Size-Speed-1	4	Amp	Size	Speed	Affect	Amp	Affect-PD-L	Affect-PD-H	Amp-Piano-L	Amp-Piano-H
Amp-Size-Speed-1	5	Amp	Size	Speed	Amp	Brightness	Amp-Sine-L	Amp-Sine-H	Brightness-Squares-L	Brightness-Squares-H
Amp-Size-Speed-1	6	Amp	Size	Speed	Pitch	Size	Pitch-Piano-H	Pitch-Piano-L	Size-Triangles-L	Size-Triangles-H
Amp-Size-Speed-1	7	Amp	Size	Speed	Amp	Size	Amp-Sung-L	Amp-Sung-H	Size-Triangles-L	Size-Triangles-H
Amp-Size-Speed-1	8	Amp	Size	Speed	Size	Amp	Size-Squares-H	Size-Squares-L	Amp-Piano-L	Amp-Piano-H
Amp-Size-Speed-1	9	Amp	Size	Speed	Affect	Size	Affect-PD-H	Affect-PD-L	Size-Circles-H	Size-Circles-L
Amp-Size-Speed-1	10	Amp	Size	Speed	Speed	Pitch	Speed-SP3-L	Speed-SP3-H	Pitch-Piano-H	Pitch-Piano-L
Amp-Size-Speed-1	11	Amp	Size	Speed	Amp	Speed	Amp-Sung-L	Amp-Sung-H	Speed-SP2-H	Speed-SP2-L
Amp-Size-Speed-1	12	Amp	Size	Speed	Speed	Amp	Speed-SP4-H	Speed-SP4-L	Amp-Sung-L	Amp-Sung-H
Amp-Size-Speed-1	13	Amp	Size	Speed	Speed	Brightness	Speed-SP4-L	Speed-SP4-H	Brightness-Squares-L	Brightness-Squares-H
Amp-Size-Speed-1	14	Amp	Size	Speed	Amp	Pitch	Amp-Whistle-L	Amp-Whistle-H	Pitch-Piano-H	Pitch-Piano-L
Amp-Size-Speed-1	15	Amp	Size	Speed	Pitch	Size	Pitch-Piano-L	Pitch-Piano-H	Size-Circles-L	Size-Circles-H
Amp-Size-Speed-1	16	Amp	Size	Speed	Affect	Amp	Affect-PD-L	Affect-PD-H	Amp-Sung-L	Amp-Sung-H

Each cell in these 4 columns denotes a particular stimulus item.

Id	TrialNum	Focal1	Focal2	Focal3	Inducer	Concurrent	InducerL	InducerR	ConcurrentL	ConcurrentR
Amp-Size-Speed-1	0	Amp	Size	Speed	Shape	Amp	Shape-BK4-H	Shape-BK4-L	Amp-Piano-H	Amp-Piano-L
Amp-Size-Speed-1	1	Amp	Size	Speed	Brightness	Speed	Brightness-Squares-H	Brightness-Squares-L	Speed-SP2-L	Speed-SP2-H
Amp-Size-Speed-1	2	Amp	Size	Speed	Size	Shape	Size-Diamonds-H	Size-Diamonds-L	Shape-BK4-H	Shape-BK4-L
Amp-Size-Speed-1	3	Amp	Size	Speed	Size	Amp	Size-Squares-H	Size-Squares-L	Amp-Sung-L	Amp-Sung-H
Amp-Size-Speed-1	4	Amp	Size	Speed	Affect	Amp	Affect-PD-L	Affect-PD-H	Amp-Piano-L	Amp-Piano-H
Amp-Size-Speed-1	5	Amp	Size	Speed	Amp	Brightness	Amp-Sine-L	Amp-Sine-H	Brightness-Squares-L	Brightness-Squares-H
Amp-Size-Speed-1	6	Amp	Size	Speed	Pitch	Size	Pitch-Piano-H	Pitch-Piano-L	Size-Triangles-L	Size-Triangles-H
Amp-Size-Speed-1	7	Amp	Size	Speed	Amp	Size	Amp-Sung-L	Amp-Sung-H	Size-Triangles-L	Size-Triangles-H
Amp-Size-Speed-1	8	Amp	Size	Speed	Size	Amp	Size-Squares-H	Size-Squares-L	Amp-Piano-L	Amp-Piano-H
Amp-Size-Speed-1	9	Amp	Size	Speed	Affect	Size	Affect-PD-H	Affect-PD-L	Size-Circles-H	Size-Circles-L
Amp-Size-Speed-1	10	Amp	Size	Speed	Speed	Pitch	Speed-SP3-L	Speed-SP3-H	Pitch-Piano-H	Pitch-Piano-L
Amp-Size-Speed-1	11	Amp	Size	Speed	Amp	Speed	Amp-Sung-L	Amp-Sung-H	Speed-SP2-H	Speed-SP2-L
Amp-Size-Speed-1	12	Amp	Size	Speed	Speed	Amp	Speed-SP4-H	Speed-SP4-L	Amp-Sung-L	Amp-Sung-H
Amp-Size-Speed-1	13	Amp	Size	Speed	Speed	Brightness	Speed-SP4-L	Speed-SP4-H	Brightness-Squares-L	Brightness-Squares-H
Amp-Size-Speed-1	14	Amp	Size	Speed	Amp	Pitch	Amp-Whistle-L	Amp-Whistle-H	Pitch-Piano-H	Pitch-Piano-L
Amp-Size-Speed-1	15	Amp	Size	Speed	Pitch	Size	Pitch-Piano-L	Pitch-Piano-H	Size-Circles-L	Size-Circles-H
Amp-Size-Speed-1	16	Amp	Size	Speed	Affect	Amp	Affect-PD-L	Affect-PD-H	Amp-Sung-L	Amp-Sung-H

Inducers refer target stimuli – that will
appear on the top of the screen

Id	TrialNum	Focal1	Focal2	Focal3	Inducer	Concurrent	InducerL	InducerR	ConcurrentL	ConcurrentR
Amp-Size-Speed-1	0	Amp	Size	Speed	Shape	Amp	Shape-BK4-H	Shape-BK4-L	Amp-Piano-H	Amp-Piano-L
Amp-Size-Speed-1	1	Amp	Size	Speed	Brightness	Speed	Brightness-Squares-H	Brightness-Squares-L	Speed-SP2-L	Speed-SP2-H
Amp-Size-Speed-1	2	Amp	Size	Speed	Size	Shape	Size-Diamonds-H	Size-Diamonds-L	Shape-BK4-H	Shape-BK4-L
Amp-Size-Speed-1	3	Amp	Size	Speed	Size	Amp	Size-Squares-H	Size-Squares-L	Amp-Sung-L	Amp-Sung-H
Amp-Size-Speed-1	4	Amp	Size	Speed	Affect	Amp	Affect-PD-L	Affect-PD-H	Amp-Piano-L	Amp-Piano-H
Amp-Size-Speed-1	5	Amp	Size	Speed	Amp	Brightness	Amp-Sine-L	Amp-Sine-H	Brightness-Squares-L	Brightness-Squares-H
Amp-Size-Speed-1	6	Amp	Size	Speed	Pitch	Size	Pitch-Piano-H	Pitch-Piano-L	Size-Triangles-L	Size-Triangles-H
Amp-Size-Speed-1	7	Amp	Size	Speed	Amp	Size	Amp-Sung-L	Amp-Sung-H	Size-Triangles-L	Size-Triangles-H
Amp-Size-Speed-1	8	Amp	Size	Speed	Size	Amp	Size-Squares-H	Size-Squares-L	Amp-Piano-L	Amp-Piano-H
Amp-Size-Speed-1	9	Amp	Size	Speed	Affect	Size	Affect-PD-H	Affect-PD-L	Size-Circles-H	Size-Circles-L
Amp-Size-Speed-1	10	Amp	Size	Speed	Speed	Pitch	Speed-SP3-L	Speed-SP3-H	Pitch-Piano-H	Pitch-Piano-L
Amp-Size-Speed-1	11	Amp	Size	Speed	Amp	Speed	Amp-Sung-L	Amp-Sung-H	Speed-SP2-H	Speed-SP2-L
Amp-Size-Speed-1	12	Amp	Size	Speed	Speed	Amp	Speed-SP4-H	Speed-SP4-L	Amp-Sung-L	Amp-Sung-H
Amp-Size-Speed-1	13	Amp	Size	Speed	Speed	Brightness	Speed-SP4-L	Speed-SP4-H	Brightness-Squares-L	Brightness-Squares-H
Amp-Size-Speed-1	14	Amp	Size	Speed	Amp	Pitch	Amp-Whistle-L	Amp-Whistle-H	Pitch-Piano-H	Pitch-Piano-L
Amp-Size-Speed-1	15	Amp	Size	Speed	Pitch	Size	Pitch-Piano-L	Pitch-Piano-H	Size-Circles-L	Size-Circles-H
Amp-Size-Speed-1	16	Amp	Size	Speed	Affect	Amp	Affect-PD-L	Affect-PD-H	Amp-Sung-L	Amp-Sung-H

Inducer column gives domain of inducer

Id	TrialNum	Focal1	Focal2	Focal3	Inducer	Concurrent	InducerL	InducerR	ConcurrentL	ConcurrentR
Amp-Size-Speed-1	0	Amp	Size	Speed	Shape	Amp	Shape-BK4-H	Shape-BK4-L	Amp-Piano-H	Amp-Piano-L
Amp-Size-Speed-1	1	Amp	Size	Speed	Brightness	Speed	Brightness-Squares-H	Brightness-Squares-L	Speed-SP2-L	Speed-SP2-H
Amp-Size-Speed-1	2	Amp	Size	Speed	Size	Shape	Size-Diamonds-H	Size-Diamonds-L	Shape-BK4-H	Shape-BK4-L
Amp-Size-Speed-1	3	Amp	Size	Speed	Size	Amp	Size-Squares-H	Size-Squares-L	Amp-Sung-L	Amp-Sung-H
Amp-Size-Speed-1	4	Amp	Size	Speed	Affect	Amp	Affect-PD-L	Affect-PD-H	Amp-Piano-L	Amp-Piano-H
Amp-Size-Speed-1	5	Amp	Size	Speed	Amp	Brightness	Amp-Sine-L	Amp-Sine-H	Brightness-Squares-L	Brightness-Squares-H
Amp-Size-Speed-1	6	Amp	Size	Speed	Pitch	Size	Pitch-Piano-H	Pitch-Piano-L	Size-Triangles-L	Size-Triangles-H
Amp-Size-Speed-1	7	Amp	Size	Speed	Amp	Size	Amp-Sung-L	Amp-Sung-H	Size-Triangles-L	Size-Triangles-H
Amp-Size-Speed-1	8	Amp	Size	Speed	Size	Amp	Size-Squares-H	Size-Squares-L	Amp-Piano-L	Amp-Piano-H
Amp-Size-Speed-1	9	Amp	Size	Speed	Affect	Size	Affect-PD-H	Affect-PD-L	Size-Circles-H	Size-Circles-L
Amp-Size-Speed-1	10	Amp	Size	Speed	Speed	Pitch	Speed-SP3-L	Speed-SP3-H	Pitch-Piano-H	Pitch-Piano-L
Amp-Size-Speed-1	11	Amp	Size	Speed	Amp	Speed	Amp-Sung-L	Amp-Sung-H	Speed-SP2-H	Speed-SP2-L
Amp-Size-Speed-1	12	Amp	Size	Speed	Speed	Amp	Speed-SP4-H	Speed-SP4-L	Amp-Sung-L	Amp-Sung-H
Amp-Size-Speed-1	13	Amp	Size	Speed	Speed	Brightness	Speed-SP4-L	Speed-SP4-H	Brightness-Squares-L	Brightness-Squares-H
Amp-Size-Speed-1	14	Amp	Size	Speed	Amp	Pitch	Amp-Whistle-L	Amp-Whistle-H	Pitch-Piano-H	Pitch-Piano-L
Amp-Size-Speed-1	15	Amp	Size	Speed	Pitch	Size	Pitch-Piano-L	Pitch-Piano-H	Size-Circles-L	Size-Circles-H
Amp-Size-Speed-1	16	Amp	Size	Speed	Affect	Amp	Affect-PD-L	Affect-PD-H	Amp-Sung-L	Amp-Sung-H

Inducer + L or R gives the specific inducer
stimulus that is in the left position and the
right position

Id	TrialNum	Focal1	Focal2	Focal3	Inducer	Concurrent	InducerL	InducerR	ConcurrentL	ConcurrentR
Amp-Size-Speed-1	0	Amp	Size	Speed	Shape	Amp	Shape-BK4-H	Shape-BK4-L	Amp-Piano-H	Amp-Piano-L
Amp-Size-Speed-1	1	Amp	Size	Speed	Brightness	Speed	Brightness-Squares-H	Brightness-Squares-L	Speed-SP2-L	Speed-SP2-H
Amp-Size-Speed-1	2	Amp	Size	Speed	Size	Shape	Size-Diamonds-H	Size-Diamonds-L	Shape-BK4-H	Shape-BK4-L
Amp-Size-Speed-1	3	Amp	Size	Speed	Size	Amp	Size-Squares-H	Size-Squares-L	Amp-Sung-L	Amp-Sung-H
Amp-Size-Speed-1	4	Amp	Size	Speed	Affect	Amp	Affect-PD-L	Affect-PD-H	Amp-Piano-L	Amp-Piano-H
Amp-Size-Speed-1	5	Amp	Size	Speed	Amp	Brightness	Amp-Sine-L	Amp-Sine-H	Brightness-Squares-L	Brightness-Squares-H
Amp-Size-Speed-1	6	Amp	Size	Speed	Pitch	Size	Pitch-Piano-H	Pitch-Piano-L	Size-Triangles-L	Size-Triangles-H
Amp-Size-Speed-1	7	Amp	Size	Speed	Amp	Size	Amp-Sung-L	Amp-Sung-H	Size-Triangles-L	Size-Triangles-H
Amp-Size-Speed-1	8	Amp	Size	Speed	Size	Amp	Size-Squares-H	Size-Squares-L	Amp-Piano-L	Amp-Piano-H
Amp-Size-Speed-1	9	Amp	Size	Speed	Affect	Size	Affect-PD-H	Affect-PD-L	Size-Circles-H	Size-Circles-L
Amp-Size-Speed-1	10	Amp	Size	Speed	Speed	Pitch	Speed-SP3-L	Speed-SP3-H	Pitch-Piano-H	Pitch-Piano-L
Amp-Size-Speed-1	11	Amp	Size	Speed	Amp	Speed	Amp-Sung-L	Amp-Sung-H	Speed-SP2-H	Speed-SP2-L
Amp-Size-Speed-1	12	Amp	Size	Speed	Speed	Amp	Speed-SP4-H	Speed-SP4-L	Amp-Sung-L	Amp-Sung-H
Amp-Size-Speed-1	13	Amp	Size	Speed	Speed	Brightness	Speed-SP4-L	Speed-SP4-H	Brightness-Squares-L	Brightness-Squares-H
Amp-Size-Speed-1	14	Amp	Size	Speed	Amp	Pitch	Amp-Whistle-L	Amp-Whistle-H	Pitch-Piano-H	Pitch-Piano-L
Amp-Size-Speed-1	15	Amp	Size	Speed	Pitch	Size	Pitch-Piano-L	Pitch-Piano-H	Size-Circles-L	Size-Circles-H
Amp-Size-Speed-1	16	Amp	Size	Speed	Affect	Amp	Affect-PD-L	Affect-PD-H	Amp-Sung-L	Amp-Sung-H

Concurrents refer to matching stimuli –
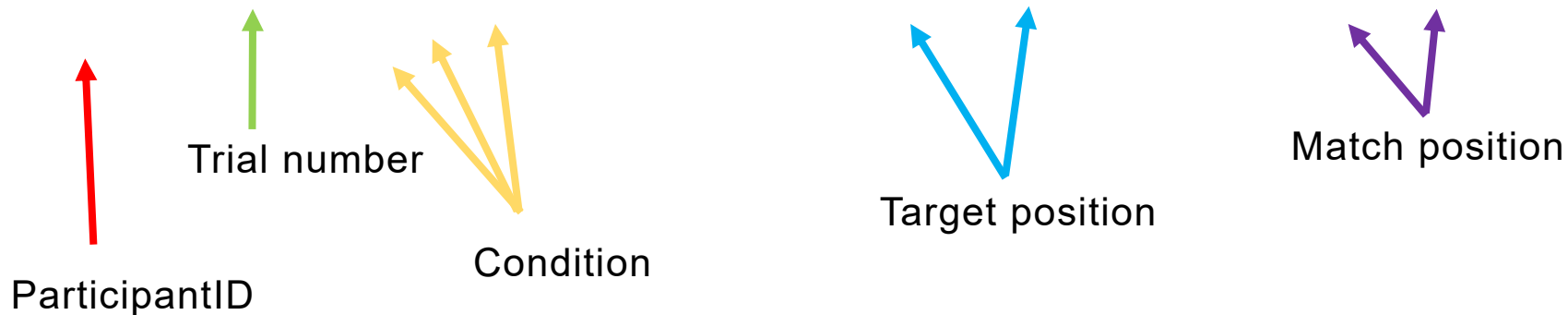that will appear below the inducers

Id	TrialNum	Focal1	Focal2	Focal3	Inducer	Concurrent	InducerL	InducerR	ConcurrentL	ConcurrentR
Amp-Size-Speed-1	0	Amp	Size	Speed	Shape	Amp	Shape-BK4-H	Shape-BK4-L	Amp-Piano-H	Amp-Piano-L
Amp-Size-Speed-1	1	Amp	Size	Speed	Brightness	Speed	Brightness-Squares-H	Brightness-Squares-L	Speed-SP2-L	Speed-SP2-H
Amp-Size-Speed-1	2	Amp	Size	Speed	Size	Shape	Size-Diamonds-H	Size-Diamonds-L	Shape-BK4-H	Shape-BK4-L
Amp-Size-Speed-1	3	Amp	Size	Speed	Size	Amp	Size-Squares-H	Size-Squares-L	Amp-Sung-L	Amp-Sung-H
Amp-Size-Speed-1	4	Amp	Size	Speed	Affect	Amp	Affect-PD-L	Affect-PD-H	Amp-Piano-L	Amp-Piano-H
Amp-Size-Speed-1	5	Amp	Size	Speed	Amp	Brightness	Amp-Sine-L	Amp-Sine-H	Brightness-Squares-L	Brightness-Squares-H
Amp-Size-Speed-1	6	Amp	Size	Speed	Pitch	Size	Pitch-Piano-H	Pitch-Piano-L	Size-Triangles-L	Size-Triangles-H
Amp-Size-Speed-1	7	Amp	Size	Speed	Amp	Size	Amp-Sung-L	Amp-Sung-H	Size-Triangles-L	Size-Triangles-H
Amp-Size-Speed-1	8	Amp	Size	Speed	Size	Amp	Size-Squares-H	Size-Squares-L	Amp-Piano-L	Amp-Piano-H
Amp-Size-Speed-1	9	Amp	Size	Speed	Affect	Size	Affect-PD-H	Affect-PD-L	Size-Circles-H	Size-Circles-L
Amp-Size-Speed-1	10	Amp	Size	Speed	Speed	Pitch	Speed-SP3-L	Speed-SP3-H	Pitch-Piano-H	Pitch-Piano-L
Amp-Size-Speed-1	11	Amp	Size	Speed	Amp	Speed	Amp-Sung-L	Amp-Sung-H	Speed-SP2-H	Speed-SP2-L
Amp-Size-Speed-1	12	Amp	Size	Speed	Speed	Amp	Speed-SP4-H	Speed-SP4-L	Amp-Sung-L	Amp-Sung-H
Amp-Size-Speed-1	13	Amp	Size	Speed	Speed	Brightness	Speed-SP4-L	Speed-SP4-H	Brightness-Squares-L	Brightness-Squares-H
Amp-Size-Speed-1	14	Amp	Size	Speed	Amp	Pitch	Amp-Whistle-L	Amp-Whistle-H	Pitch-Piano-H	Pitch-Piano-L
Amp-Size-Speed-1	15	Amp	Size	Speed	Pitch	Size	Pitch-Piano-L	Pitch-Piano-H	Size-Circles-L	Size-Circles-H
Amp-Size-Speed-1	16	Amp	Size	Speed	Affect	Amp	Affect-PD-L	Affect-PD-H	Amp-Sung-L	Amp-Sung-H

Concurrent column gives the domain of
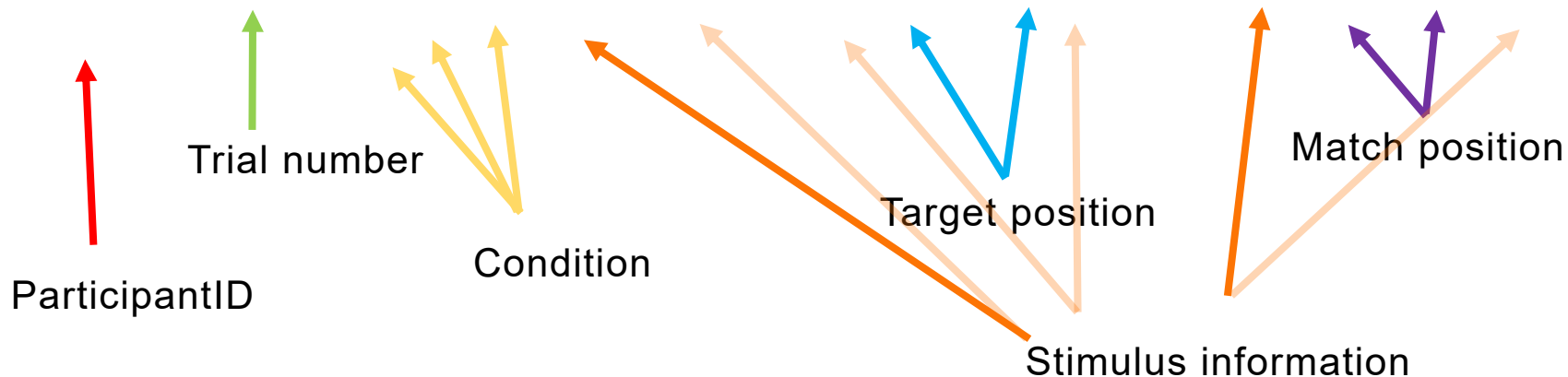the concurrent for that trial

Id	TrialNum	Focal1	Focal2	Focal3	Inducer	Concurrent	InducerL	InducerR	ConcurrentL	ConcurrentR
Amp-Size-Speed-1	0	Amp	Size	Speed	Shape	Amp	Shape-BK4-H	Shape-BK4-L	Amp-Piano-H	Amp-Piano-L
Amp-Size-Speed-1	1	Amp	Size	Speed	Brightness	Speed	Brightness-Squares-H	Brightness-Squares-L	Speed-SP2-L	Speed-SP2-H
Amp-Size-Speed-1	2	Amp	Size	Speed	Size	Shape	Size-Diamonds-H	Size-Diamonds-L	Shape-BK4-H	Shape-BK4-L
Amp-Size-Speed-1	3	Amp	Size	Speed	Size	Amp	Size-Squares-H	Size-Squares-L	Amp-Sung-L	Amp-Sung-H
Amp-Size-Speed-1	4	Amp	Size	Speed	Affect	Amp	Affect-PD-L	Affect-PD-H	Amp-Piano-L	Amp-Piano-H
Amp-Size-Speed-1	5	Amp	Size	Speed	Amp	Brightness	Amp-Sine-L	Amp-Sine-H	Brightness-Squares-L	Brightness-Squares-H
Amp-Size-Speed-1	6	Amp	Size	Speed	Pitch	Size	Pitch-Piano-H	Pitch-Piano-L	Size-Triangles-L	Size-Triangles-H
Amp-Size-Speed-1	7	Amp	Size	Speed	Amp	Size	Amp-Sung-L	Amp-Sung-H	Size-Triangles-L	Size-Triangles-H
Amp-Size-Speed-1	8	Amp	Size	Speed	Size	Amp	Size-Squares-H	Size-Squares-L	Amp-Piano-L	Amp-Piano-H
Amp-Size-Speed-1	9	Amp	Size	Speed	Affect	Size	Affect-PD-H	Affect-PD-L	Size-Circles-H	Size-Circles-L
Amp-Size-Speed-1	10	Amp	Size	Speed	Speed	Pitch	Speed-SP3-L	Speed-SP3-H	Pitch-Piano-H	Pitch-Piano-L
Amp-Size-Speed-1	11	Amp	Size	Speed	Amp	Speed	Amp-Sung-L	Amp-Sung-H	Speed-SP2-H	Speed-SP2-L
Amp-Size-Speed-1	12	Amp	Size	Speed	Speed	Amp	Speed-SP4-H	Speed-SP4-L	Amp-Sung-L	Amp-Sung-H
Amp-Size-Speed-1	13	Amp	Size	Speed	Speed	Brightness	Speed-SP4-L	Speed-SP4-H	Brightness-Squares-L	Brightness-Squares-H
Amp-Size-Speed-1	14	Amp	Size	Speed	Amp	Pitch	Amp-Whistle-L	Amp-Whistle-H	Pitch-Piano-H	Pitch-Piano-L
Amp-Size-Speed-1	15	Amp	Size	Speed	Pitch	Size	Pitch-Piano-L	Pitch-Piano-H	Size-Circles-L	Size-Circles-H
Amp-Size-Speed-1	16	Amp	Size	Speed	Affect	Amp	Affect-PD-L	Affect-PD-H	Amp-Sung-L	Amp-Sung-H

Concurrent + L or R gives the specific
stimulus that acts as concurrent,
positioned on left or right

Id	TrialNum	Focal1	Focal2	Focal3	Inducer	Concurrent	InducerL	InducerR	ConcurrentL	ConcurrentR
Amp-Size-Speed-1	0	Amp	Size	Speed	Shape	Amp	Shape-BK4-H	Shape-BK4-L	Amp-Piano-H	Amp-Piano-L
Amp-Size-Speed-1	1	Amp	Size	Speed	Brightness	Speed	Brightness-Squares-H	Brightness-Squares-L	Speed-SP2-L	Speed-SP2-H
Amp-Size-Speed-1	2	Amp	Size	Speed	Size	Shape	Size-Diamonds-H	Size-Diamonds-L	Shape-BK4-H	Shape-BK4-L
Amp-Size-Speed-1	3	Amp	Size	Speed	Size	Amp	Size-Squares-H	Size-Squares-L	Amp-Sung-L	Amp-Sung-H
Amp-Size-Speed-1	4	Amp	Size	Speed	Affect	Amp	Affect-PD-L	Affect-PD-H	Amp-Piano-L	Amp-Piano-H
Amp-Size-Speed-1	5	Amp	Size	Speed	Amp	Brightness	Amp-Sine-L	Amp-Sine-H	Brightness-Squares-L	Brightness-Squares-H
Amp-Size-Speed-1	6	Amp	Size	Speed	Pitch	Size	Pitch-Piano-H	Pitch-Piano-L	Size-Triangles-L	Size-Triangles-H
Amp-Size-Speed-1	7	Amp	Size	Speed	Amp	Size	Amp-Sung-L	Amp-Sung-H	Size-Triangles-L	Size-Triangles-H
Amp-Size-Speed-1	8	Amp	Size	Speed	Size	Amp	Size-Squares-H	Size-Squares-L	Amp-Piano-L	Amp-Piano-H
Amp-Size-Speed-1	9	Amp	Size	Speed	Affect	Size	Affect-PD-H	Affect-PD-L	Size-Circles-H	Size-Circles-L
Amp-Size-Speed-1	10	Amp	Size	Speed	Speed	Pitch	Speed-SP3-L	Speed-SP3-H	Pitch-Piano-H	Pitch-Piano-L
Amp-Size-Speed-1	11	Amp	Size	Speed	Amp	Speed	Amp-Sung-L	Amp-Sung-H	Speed-SP2-H	Speed-SP2-L
Amp-Size-Speed-1	12	Amp	Size	Speed	Speed	Amp	Speed-SP4-H	Speed-SP4-L	Amp-Sung-L	Amp-Sung-H
Amp-Size-Speed-1	13	Amp	Size	Speed	Speed	Brightness	Speed-SP4-L	Speed-SP4-H	Brightness-Squares-L	Brightness-Squares-H
Amp-Size-Speed-1	14	Amp	Size	Speed	Amp	Pitch	Amp-Whistle-L	Amp-Whistle-H	Pitch-Piano-H	Pitch-Piano-L
Amp-Size-Speed-1	15	Amp	Size	Speed	Pitch	Size	Pitch-Piano-L	Pitch-Piano-H	Size-Circles-L	Size-Circles-H
Amp-Size-Speed-1	16	Amp	Size	Speed	Affect	Amp	Affect-PD-L	Affect-PD-H	Amp-Sung-L	Amp-Sung-H

ParticipantID

Trial number

Condition

Target position

Match position

Id	TrialNum	Focal1	Focal2	Focal3	Inducer	Concurrent	InducerL	InducerR	ConcurrentL	ConcurrentR
Amp-Size-Speed-1	0	Amp	Size	Speed	Shape	Amp	Shape-BK4-H	Shape-BK4-L	Amp-Piano-H	Amp-Piano-L
Amp-Size-Speed-1	1	Amp	Size	Speed	Brightness	Speed	Brightness-Squares-H	Brightness-Squares-L	Speed-SP2-L	Speed-SP2-H
Amp-Size-Speed-1	2	Amp	Size	Speed	Size	Shape	Size-Diamonds-H	Size-Diamonds-L	Shape-BK4-H	Shape-BK4-L
Amp-Size-Speed-1	3	Amp	Size	Speed	Size	Amp	Size-Squares-H	Size-Squares-L	Amp-Sung-L	Amp-Sung-H
Amp-Size-Speed-1	4	Amp	Size	Speed	Affect	Amp	Affect-PD-L	Affect-PD-H	Amp-Piano-L	Amp-Piano-H
Amp-Size-Speed-1	5	Amp	Size	Speed	Amp	Brightness	Amp-Sine-L	Amp-Sine-H	Brightness-Squares-L	Brightness-Squares-H
Amp-Size-Speed-1	6	Amp	Size	Speed	Pitch	Size	Pitch-Piano-H	Pitch-Piano-L	Size-Triangles-L	Size-Triangles-H
Amp-Size-Speed-1	7	Amp	Size	Speed	Amp	Size	Amp-Sung-L	Amp-Sung-H	Size-Triangles-L	Size-Triangles-H
Amp-Size-Speed-1	8	Amp	Size	Speed	Size	Amp	Size-Squares-H	Size-Squares-L	Amp-Piano-L	Amp-Piano-H
Amp-Size-Speed-1	9	Amp	Size	Speed	Affect	Size	Affect-PD-H	Affect-PD-L	Size-Circles-H	Size-Circles-L
Amp-Size-Speed-1	10	Amp	Size	Speed	Speed	Pitch	Speed-SP3-L	Speed-SP3-H	Pitch-Piano-H	Pitch-Piano-L
Amp-Size-Speed-1	11	Amp	Size	Speed	Amp	Speed	Amp-Sung-L	Amp-Sung-H	Speed-SP2-H	Speed-SP2-L
Amp-Size-Speed-1	12	Amp	Size	Speed	Speed	Amp	Speed-SP4-H	Speed-SP4-L	Amp-Sung-L	Amp-Sung-H
Amp-Size-Speed-1	13	Amp	Size	Speed	Speed	Brightness	Speed-SP4-L	Speed-SP4-H	Brightness-Squares-L	Brightness-Squares-H
Amp-Size-Speed-1	14	Amp	Size	Speed	Amp	Pitch	Amp-Whistle-L	Amp-Whistle-H	Pitch-Piano-H	Pitch-Piano-L
Amp-Size-Speed-1	15	Amp	Size	Speed	Pitch	Size	Pitch-Piano-L	Pitch-Piano-H	Size-Circles-L	Size-Circles-H
Amp-Size-Speed-1	16	Amp	Size	Speed	Affect	Amp	Affect-PD-L	Affect-PD-H	Amp-Sung-L	Amp-Sung-H

ParticipantID

Trial number

Condition

Target position

Stimulus information

Match position

Id	TrialNum	Focal1	Focal2	Focal3	Inducer	Concurrent	InducerL	InducerR	ConcurrentL	ConcurrentR
Amp-Size-Speed-1	0	Amp	Size	Speed	Shape	Amp	Shape-BK4-H	Shape-BK4-L	Amp-Piano-H	Amp-Piano-L
Amp-Size-Speed-1	1	Amp	Size	Speed	Brightness	Speed	Brightness-Squares-H	Brightness-Squares-L	Speed-SP2-L	Speed-SP2-H
Amp-Size-Speed-1	2	Amp	Size	Speed	Size	Shape	Size-Diamonds-H	Size-Diamonds-L	Shape-BK4-H	Shape-BK4-L
Amp-Size-Speed-1	3	Amp	Size	Speed	Size	Amp	Size-Squares-H	Size-Squares-L	Amp-Sung-L	Amp-Sung-H
Amp-Size-Speed-1	4	Amp	Size	Speed	Affect	Amp	Affect-PD-L	Affect-PD-H	Amp-Piano-L	Amp-Piano-H
Amp-Size-Speed-1	5	Amp	Size	Speed	Amp	Brightness	Amp-Sine-L	Amp-Sine-H	Brightness-Squares-L	Brightness-Squares-H
Amp-Size-Speed-1	6	Amp	Size	Speed	Pitch	Size	Pitch-Piano-H	Pitch-Piano-L	Size-Triangles-L	Size-Triangles-H
Amp-Size-Speed-1	7	Amp	Size	Speed	Amp	Size	Amp-Sung-L	Amp-Sung-H	Size-Triangles-L	Size-Triangles-H
Amp-Size-Speed-1	8	Amp	Size	Speed	Size	Amp	Size-Squares-H	Size-Squares-L	Amp-Piano-L	Amp-Piano-H
Amp-Size-Speed-1	9	Amp	Size	Speed	Affect	Size	Affect-PD-H	Affect-PD-L	Size-Circles-H	Size-Circles-L
Amp-Size-Speed-1	10	Amp	Size	Speed	Speed	Pitch	Speed-SP3-L	Speed-SP3-H	Pitch-Piano-H	Pitch-Piano-L
Amp-Size-Speed-1	11	Amp	Size	Speed	Amp	Speed	Amp-Sung-L	Amp-Sung-H	Speed-SP2-H	Speed-SP2-L
Amp-Size-Speed-1	12	Amp	Size	Speed	Speed	Amp	Speed-SP4-H	Speed-SP4-L	Amp-Sung-L	Amp-Sung-H
Amp-Size-Speed-1	13	Amp	Size	Speed	Speed	Brightness	Speed-SP4-L	Speed-SP4-H	Brightness-Squares-L	Brightness-Squares-H
Amp-Size-Speed-1	14	Amp	Size	Speed	Amp	Pitch	Amp-Whistle-L	Amp-Whistle-H	Pitch-Piano-H	Pitch-Piano-L
Amp-Size-Speed-1	15	Amp	Size	Speed	Pitch	Size	Pitch-Piano-L	Pitch-Piano-H	Size-Circles-L	Size-Circles-H
Amp-Size-Speed-1	16	Amp	Size	Speed	Affect	Amp	Affect-PD-L	Affect-PD-H	Amp-Sung-L	Amp-Sung-H

With this information, we only need the participant's response to complete the experiment.
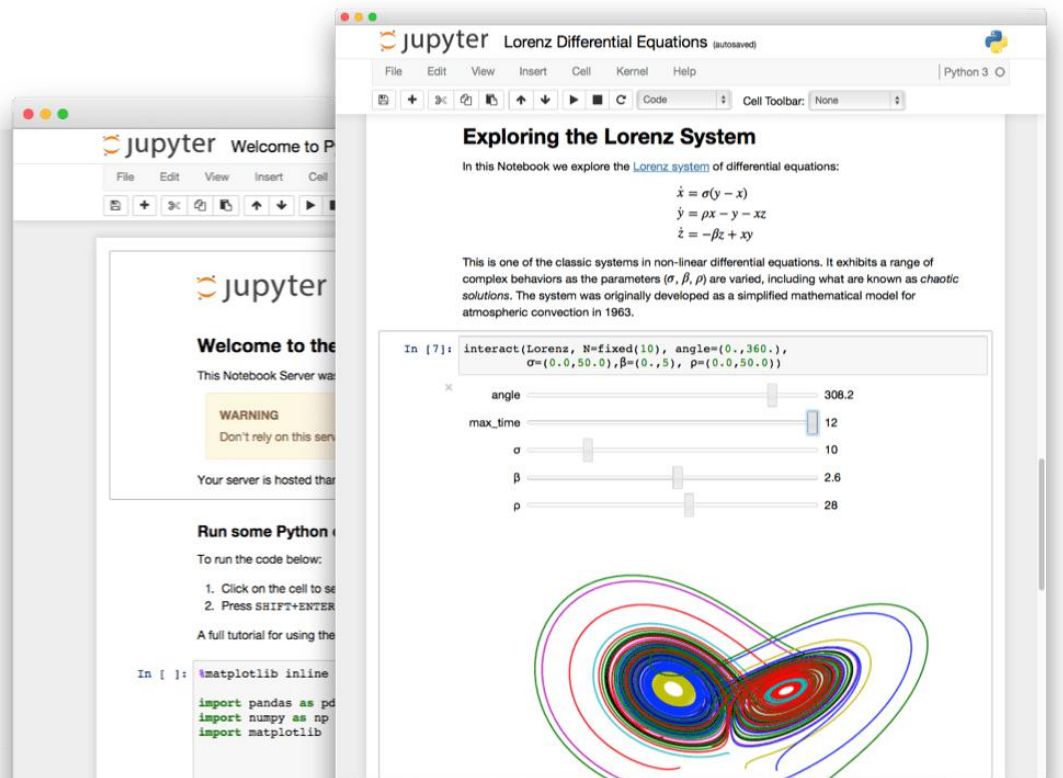
And now for something completely different

Intro to Jupyter notebooks

Intro to Jupyter notebooks

Web application to create documents that can contain:

    live code
    images
    videos
    equations
    text

Intro to Jupyter notebooks

Can use them to run code in over 40 programming languages, including Python and R

Name is actually a combination of Julia, Python and R (previously known as iPython notebooks)

R notebooks now integrated with R studio – can use them in the Jupyter app as well

What can I use them for?

- As a personal 'lab' notebook, i.e., to prepare a write up before writing up

- To be more organised

- To share data

- For teaching

What can I use them for?

Shen., H. (2014). Interactive notebooks: Sharing the code. *Nature,* 515. p.151-152

Useful commands

COMMAND	SHORTCUT
Ctrl + ENTER	Run current cell
Shift + ENTER	Run current cell and move to cell below
Alt + ENTER	Run current cell and create new cell below
Esc	Toggle between edit mode (edit cells) and command mode (edit doc structure)
When in command mode…	
Y	Turn cell into code cell
M	Turn cell into markdown cell
A	Create new cell above
B	Create new cell below
D + D	Delete cell

Ah, yes, where was I?

Generating trial structure

We have 9 focal domains.

Each condition has three focal domains – e.g. [Pitch, Shape, Affect]

Each focal domain tested against every other domain (not itself)

Each focal domain will be tested as Inducer (thing to be matched to) and Concurrent (thing to match)

Each of these tests done twice.

L/R, top/bottom locations of stimuli randomly determined

Generating trial structure

For domain categories:

- Use half in inducer context, half in concurrent context

e.g. for pitch as focal domain

Half of inducers use sine (pure) tone, half use sung

Half of concurrents use piano, half use whistled

Generating trial structure

1. Match focal domains with non-focal domains the correct number of times

2. Choose stimulus categories for when they are inducers, when they are concurrents

3. Randomly determine locations of stimulus items

Generating trial structure

For a given stimulus item, we will note:

1. The domain

2. The type/category of the stimulus

3. The value of the stimulus (low or high)

Go through the trial structure generator

```python
def format_df_tokens_and_locations(df, tag, selectors):

    # duplicate dataframe
    # use deepcopy, otherwise changes will occur to both dataframes
    df1 = df
    df2 = deepcopy(df1)

    # put dataframes in list, so we can loop over the two dfs
    dframes = [df1, df2]

    # choose order of tags
    # it input tag is INDUCER, the other tag is CONCURRENT, and vice versa
    if tag == "Inducer":
        tag2 = "Concurrent"
    else:
        tag2 = "Inducer"

    # create location lists that will match high low values for each stimulus item
    left_right = ["L", "H"]
    # multiply list above by 12 to give a list of 24 L/H values
    left_right2 = left_right * 12

    # create list to hold selected tokens
    df_tokens = []

    # for each data frame:
    for frame in range(len(dframes)):
```

```python
def format_df_tokens_and_locations(df, tag, selectors):

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    df_tokens = []

    # for each data frame:
    for frame in range(len(dframes)):
```

Try to figure out what each function does.

What is the overall process?

```python
def format_df_tokens_and_locations(df, tag, selectors):

    # duplicate dataframe
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    # for each data frame:
    for frame in range(len(dframes)):
```

Each line is commented to help you figure out what is going on

```python
def format_df_tokens_and_locations(df, tag, selectors):

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    # create list to hold selected tokens
    df_tokens = []

    # for each data frame:
    for frame in range(len(dframes)):
```

Ask for help if you need it!

Useful links

Helen Shen's article about iPython notebooks
http://www.nature.com/news/interactive-notebooks-sharing-the-code-1.16261

About Jupyter
http://jupyter.org/

Installing Jupyter notebooks (focus: Python)
http://jupyter.readthedocs.io/en/latest/install.html
http://jupyter-notebook-beginner-guide.readthedocs.io/en/latest/what_is_jupyter.html#

Installing Jupyter notebooks for R
https://www.datacamp.com/community/blog/jupyter-notebook-r#gs.vfp_JuQ

A gallery of interesting notebooks
https://github.com/jupyter/jupyter/wiki/A-gallery-of-interesting-Jupyter-Notebooks#introductory-tutorials