

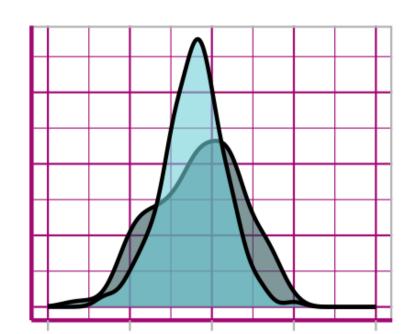


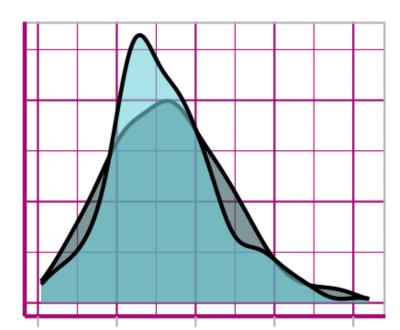
## Data visualisation with ggplot2

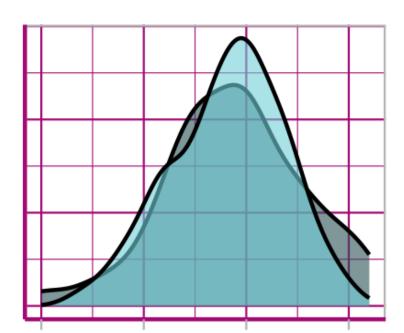
**Dr. Ryssa Moffat** 

R-Ladies Zurich

14.11.2024

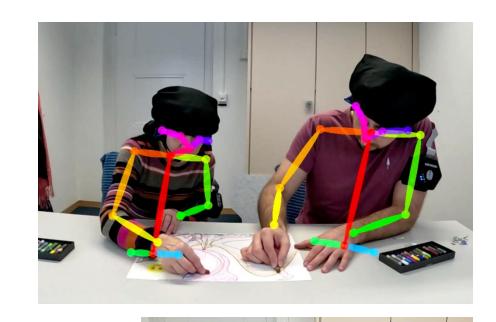






### **About me**

- Postdoctoral Researcher at ETH Zurich
- PhD in Cognitive Science
- R devotee since 2016











### Plan

#### 1. Basics

• Syntax, Colors, Theme, Combining, Saving

#### 2. Important steps

- Pinning down relevant comparisons
- Reducing redundancy

#### 3. Cool things

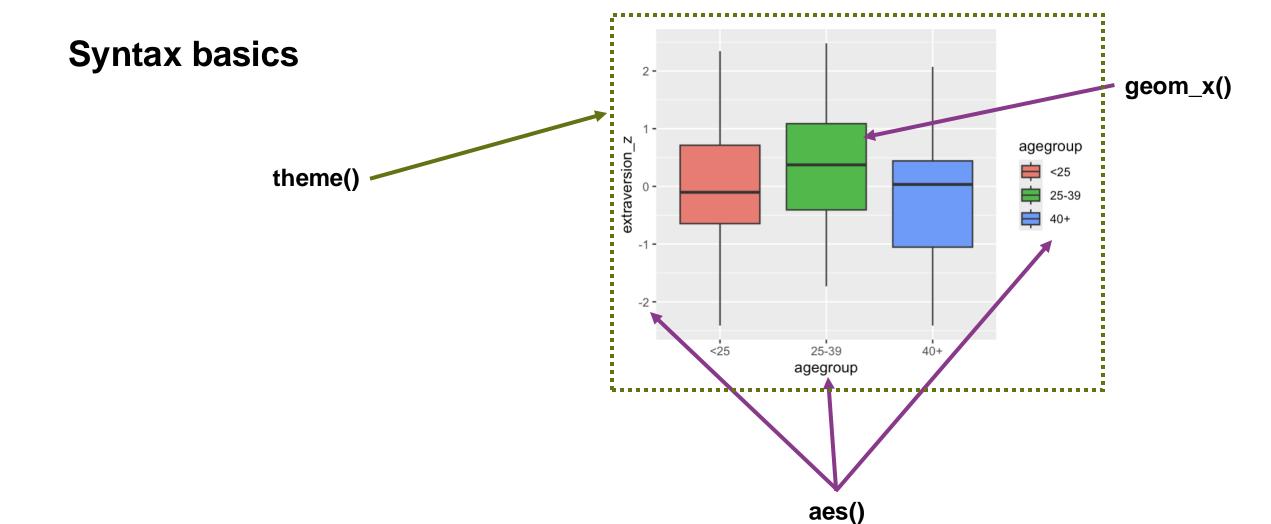
- Models into plots
- 3D plots





# **BASICS**





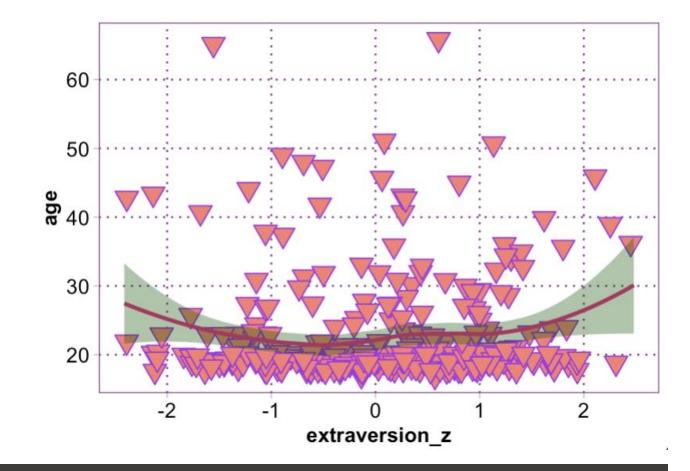
```
# boxplots (group with continuous, base ggplot colors)
personality_traits1 %>%
   ggplot(aes(x = agegroup, y = extraversion_z, fill = agegroup))+
   geom_boxplot()
```



### Syntax basics

#### **Familiarization with syntax:**

- 1. aes()
- 2. geom\_x()
- 3. theme()

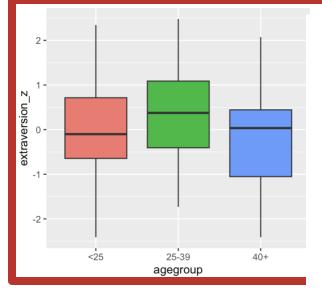


```
# scatter plot with trend line
# try changing color, fill, method (loess, lm)
personality_traits %>%
    ggplot(aes(x = extraversion_z, y = age)) +
    geom_jitter(color = "purple", fill = "salmon", shape = 25, size = 4)+
    geom_smooth(method = "loess", color = "maroon", fill = "darkgreen")
```



### **Colors**

- **Color inspiration**
- Match existing colors
- <u>Coblis Color Blindness Simulator</u> 3.





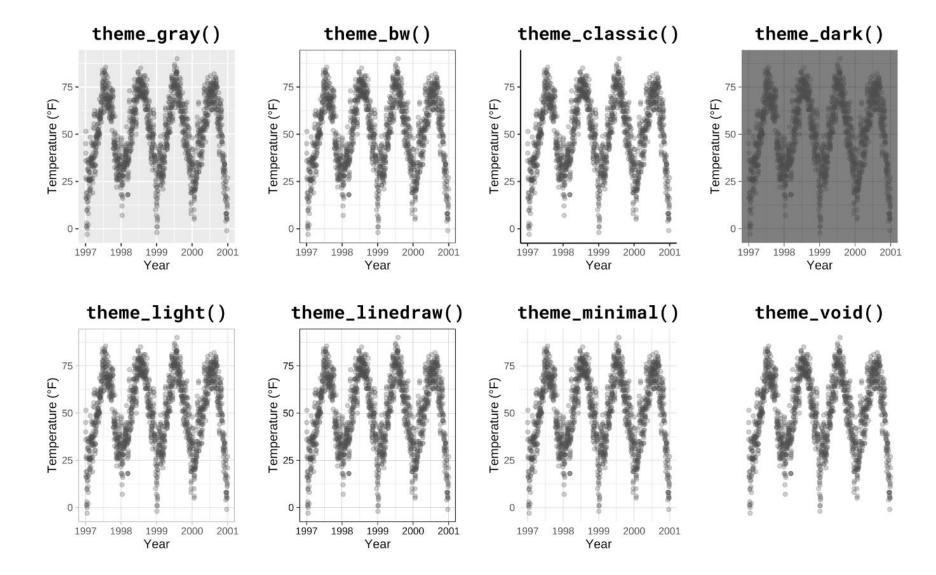
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cornsilk1	dodgerblue2 dodgerblue1	gray43	grey1			C	ornsilk2	dodge	rblue3	gray44	1 grey
comflowerblue	dodgerblue	gray42 gray41	grey0 grey			C	ornsilk1	dodge	rblue2	gray43	3 grey
coral4	dimgrey	gray40	greenyellow	П			omsilk	dodge	rblue1	gray42	2 grey
coral3	dimgray deepskyblue4	gray39 gray38	green4 green3			com	flowerblu	e dodge	arbluo	gray41	
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chocolate2	deeppink4	gray34 gray33	gray99				coral2	deepsk	vhlue4	gray38	greer
chocolate1	deeppink3	gray32	gray98								
chocolate	deeppink2	gray31	gray97				coral1	deepsk	yblue3	gray37	7 green
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chartreuse2	darkviolet	gray28	gray94			-	a a a late 4	doonal	n delune d	0.000.00	
chartreuse1	darkturquoise	gray27	gray93			cn	ocolate4	deepsk	yolue	gray35	gree gree
chartreuse	darkslategrey	gray26	gray92	П		ch	ocolate3	deeps	kyblue	gray34	gray1
	darkslategray4 darkslategray3	gray25 gray24	gray91 gray90			ch	ocolate2	deep	pink4	gray33	gray9
	darkslategray2	gray24	gray89								
	darkslategray1	gray22	gray88			cm	ocolate1	deep	pinka	gray32	2 grays
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	darksiateblue darkseagreen4	gray20 gray19	gray86 gray85			cha	artreuse4	deep	pink1	gray30	gray9
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brown3	darksalmon	gray13	gray80			cha	artreuse1	darktur	auoise	gray27	7 gray9
brown2	darkred	gray13	gray79	3				CHAIR TELES	quotoc	grayer	gray
brown1	darkorchid4	gray12	gray78		ey36	honeydew1	lightseagreen	olivedrab2	rosybrown4	thistle2	
brown	darkorchid3 darkorchid2	gray11 gray10	gray77 gray76		ey35 ey34	honeydew grey100	lightsalmon4 lightsalmon3	olivedrab1	rosybrown3 rosybrown2	thistle1	
blue4	darkorchid1	gray9	gray75		ey33	grey99	lightsalmon2	oldiace	rosybrown1	tan4	
blue3	darkorchid	gray8	gray74	gr	ey32	grey98	lightsalmon1	navyblue	rosybrown	tan3	
blue2	darkorange4	gray7	gray73		ey31	grey97	lightsalmon	navy	red4	tan2	
blue1	darkorange3 darkorange2	gray6 gray5	gray72 gray71		ey30 ey29	grey96 grey95	lightpink4 lightpink3	navajowhite4 navajowhite3	red3 red2	tan1	
lanchedalmono	ddarkorange1	gray4	gray70		ey28	grey94	lightpink2	navajownite2	red1	steelblue4	
black	darkorange	gray3	gray69	gr	ey27	grey93	lightpink1	navajowhite1	red	steelblue3	
	tarkolivegreen	4 gray2	gray68		ey26	grey92	lightpink	navajowhite	purple4	steelblue2	
	tarkolivegreen: tarkolivegreen:	gray1 gray0	gray67 gray66		ey25 ey24	grey91 grey90	lightgrey	moccasin mistyrose4	purple3 purple2	steelblue1 steelblue	
	tarkolivegreen:	1 gray	gray65		ey23	grey89	lightgray	mistyrose3	purple1	springgreen4	
	darkolivegreen	goldenrod4	gray64	gr	ey22		ghtgoldenrodyell	lownistyrose2	purple	springgreen3	
beige	darkmagenta	goldenrod3	gray63		ey21	grey87	lightgoldenrod4		powderblue	springgreen2	
azure4 azure3	darkkhaki darkgrey	goldenrod2 goldenrod1	gray62 gray61		ey20 ey19	grey86 grey85	lightgoldenrod2		plum4 plum3	springgreen1 springgreen	
azure3	darkgreen	goldenrod	gray60		ey18	grey84	lightgoldenrod1		plum3	snow4	
azure1	darkgray	gold4	gray59		ey17	grey83	lightgoldenrod	nediumvioletre	d plum1	snow3	
	darkgoldenrod4		gray58		ey16	grey82		nediumturquois		snow2	
	darkgoldenrod3		gray57		ey15 ev14	grey81		ediumspringgre nediumslateblu		snow1	
	darkgoldenrod2 darkgoldenrod1		gray56 gray55		ey14 ey13	grey80 grey79		nediumslatebii nediumseagree	-	slategrey	
	darkgoldenrod		gray54		ey12	grey78		mediumpurple		slategray4	
aquamarine	darkcyan	gainsboro	gray53	-	ey11	grey77		mediumpurple		slategray3	
antiquewhite4	darkblue	forestgreen	gray52	gr	ey10	grey76		mediumpurple		slategray2	
antiquewhite3	cyan4	floralwhite	gray51	gr	геуу	grey75	lightblue3	mediumpurple	peachpuff4	slategray1	

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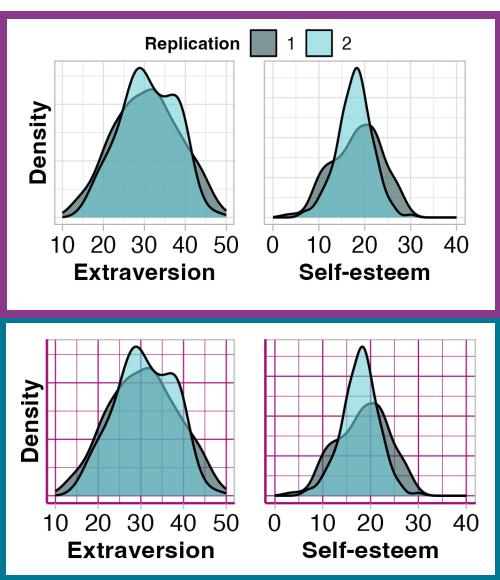


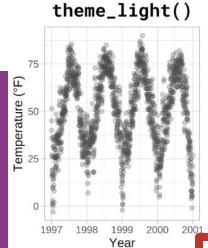
### **Setting your theme**

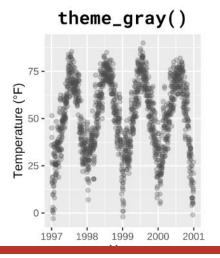


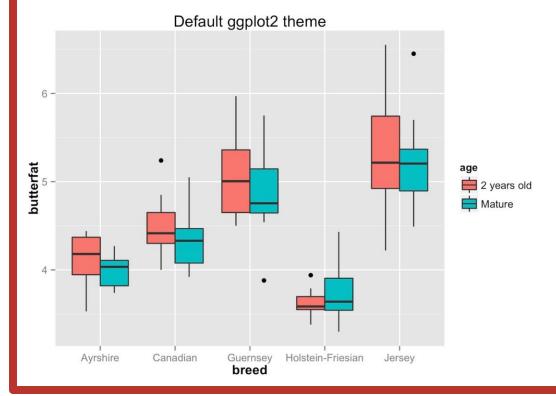


### **Setting your theme**











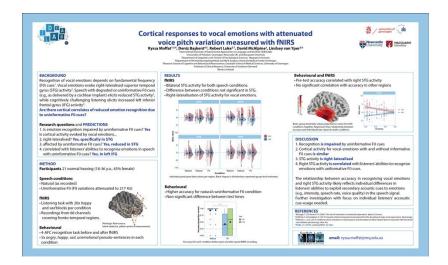
## **Setting your theme**

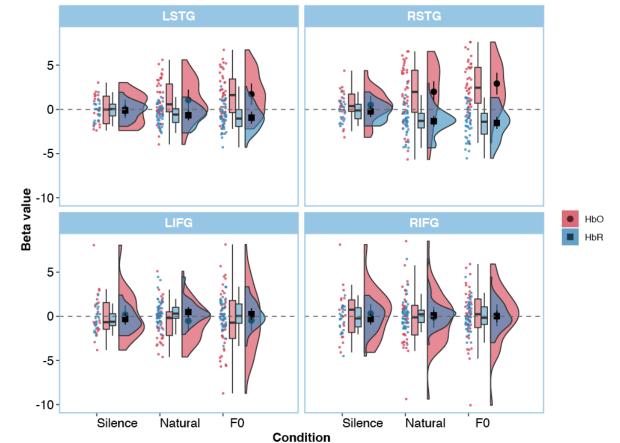
#### Why?

- Aesthetically pleasing posters
- A unique "fingerprint"

#### What kinds of components?

- 1. Font (face, size, color)
- 2. Background, panels
- 3. Axis labels + ticks
- 4. So much more!



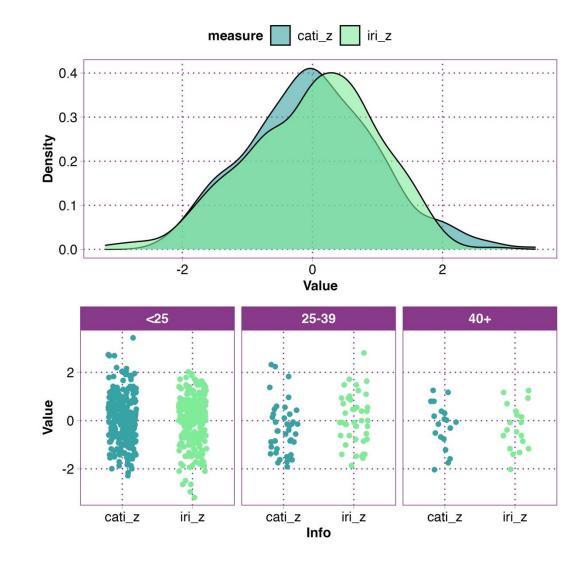




## **Composite figures**

#### ggarrange()

- 1. nrow/ncol
- 2. widths/heights
- 3. common legends

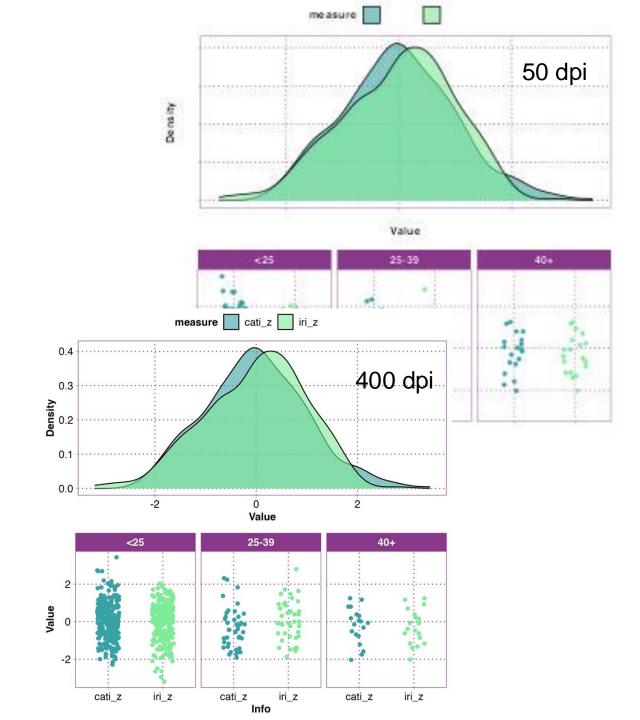




## **Saving figures**

#### ggsave()

- Saves the last figure you ran
- Set resolution in DPI (dots per inch)
  - 300 minimum for print, more = better

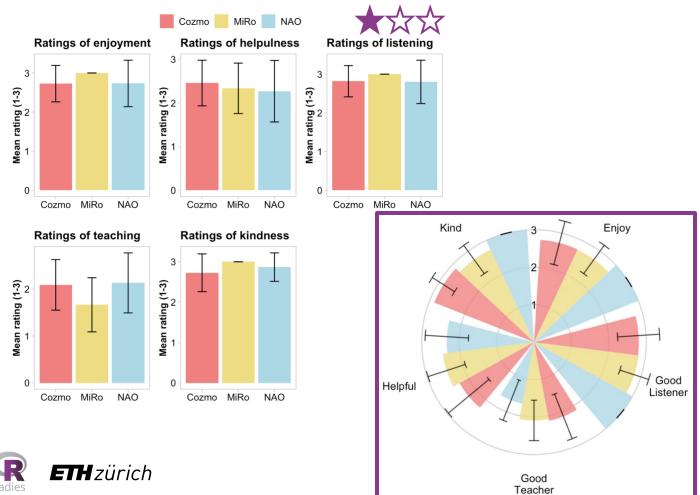


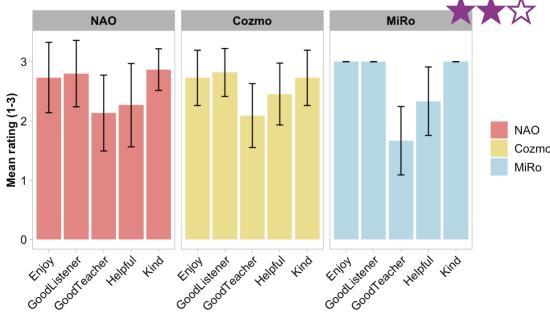


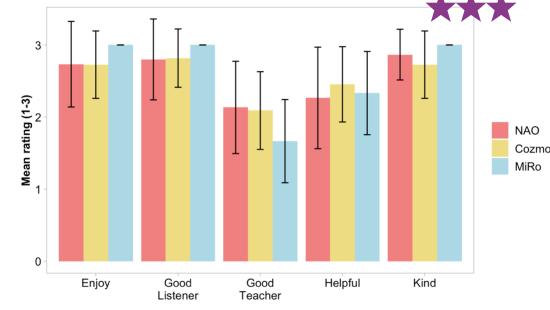
## IMPORTANT STEPS



- Put things to be compared side by side
- Try to only have each label once









- Put things to be compared side by side
- Try to only have each label once

#### **QUESTIONS TO CONSIDER:**

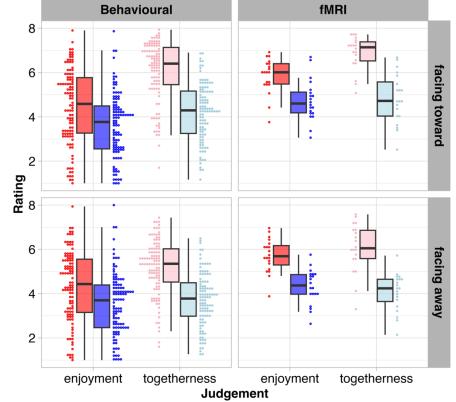
- Are the conditions/items to be compared described in one column?
- Do any columns have enough in common to be combined and described in a new column?
- Should the numeric information be simplified and shared as a table elsewhere?



• We have ratings on scale of 1-4 and ratings on scale of 1-8. How can we plot them together?

ID	synchrony	judgement	rating	experiment
Beh1	synchronous	enjoyment	4	behavioural
Beh2	asynchronous	togetherness	8	behavioural

ID	synchrony	judgement	rating	experiment
Fmri1	synchronous	enjoyment	1	fMRI
Fmri2	asynchronous	togetherness	2	fMRI



S



ID	experiment	synchrony	judgement	rating
Beh1	behavioural	synchronous	enjoyment	4
Beh2	behavioural	asynchronous	togetherness	8
Fmri1	fMRI	synchronous	enjoyment	2
Fmri2	fMRI	asynchronous	togetherness	4

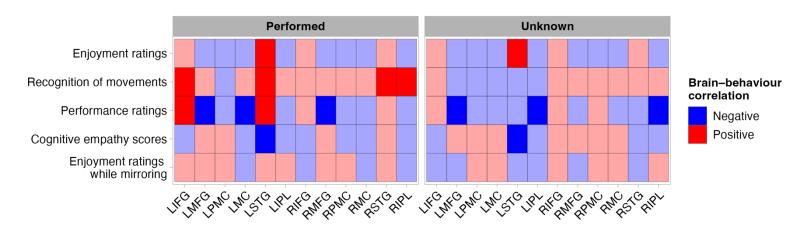
**Synchrony** 

**=** synchronous

asynchronoussynchronousasynchronous

%>%

• Simple heat maps can really help present multi-dimensonal data.



Judgement/Measure	Condition	Brain area	Value	Significant	Direction
Enjoyment	Performed	LIFG	0.04	no	postive
Recognition	Performed	LIFG	0.6	yes	positive
Performance	Performed	LIFG	0.4	yes	positive
Empathy	Performed	LIFG	-0.01	no	positive
Miroring enjoyment	Performed	LIFG	0.03	no	negative





- Pivoting longer and wider are almost always the solution.
- Typically long data is more useful for plotting.
- But sometimes, the data must get wider before it gets longer.

ID	Item	Value
S1	Group	Α
S1	Pic1	0.5
S1	Pic2	0.2
S1	Pic3	0.1
S2	Group	В
S2	Pic1	0.8
S2	Pic2	0.3
S2	Pic3	0.1

ID	Group	Pic1	Pic2	Pic3
S1	Α	0.5	0.2	0.4
S2	В	0.8	0.3	0.1

ID	Group	Picture	Rating	Price	Annimate
S1	А	Pic1	0.5	100	annimate
S1	А	Pic2	0.2	100	annimate
S1	Α	Pic3	0.3	100	inannimate
S1	В	Pic1	0.8	20	annimate
S2	В	Pic2	0.3	20	annimate
S2	В	Pic3	0.1	20	inannimate



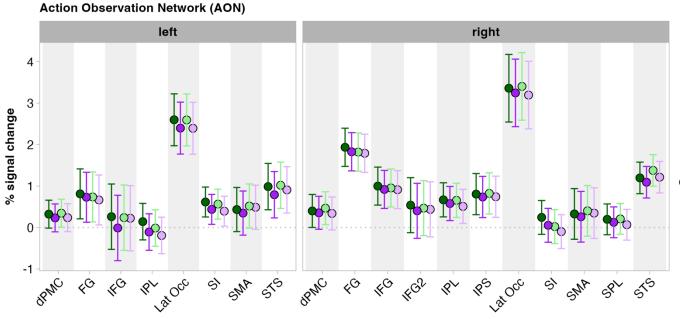


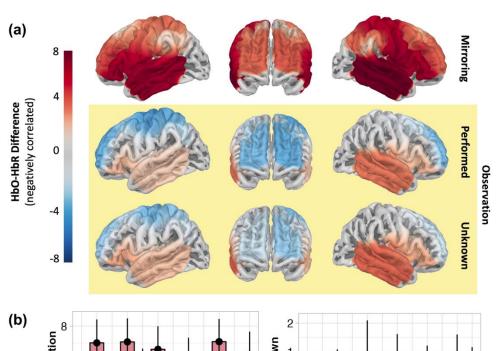
## **EXCITING THINGS**

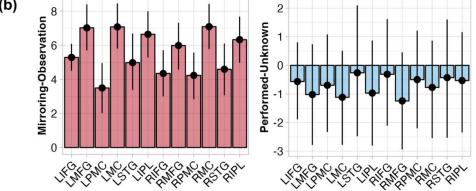


## From models to plots

- Plotting raw data is ALWAYS the first step.
- Showing model parameter estimates and contrast estimates can also be helpful.







#### Condition

- sync + facing toward
- sync + facing away
- async + facing toward
- async + facing away





## 3D plots

### Plotly 3D plots!

