

Aesthetics in Cognitive Neuroscience: The basics of pretty scientific figures

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Why bother?
Do aesthetics matter in research/science? If yes, how so?

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Readers often “scan” papers by glancing over figures

Figures need to convey the message fast and accurately

Clear and beautiful figures motivate a person to read

Developments in publishing

Graphical abstract & summary figure in cover letter

More complex data plotting: bar graphs often insufficient

Recognition of your work and citations

Nicer graphics might help remembering

Good graphics help understanding the results

Good/transparent data plotting may make the reader trust the results more

Other benefits for you

Beautiful and effective plotting makes talks better

Building good figures may help you with data interpretation

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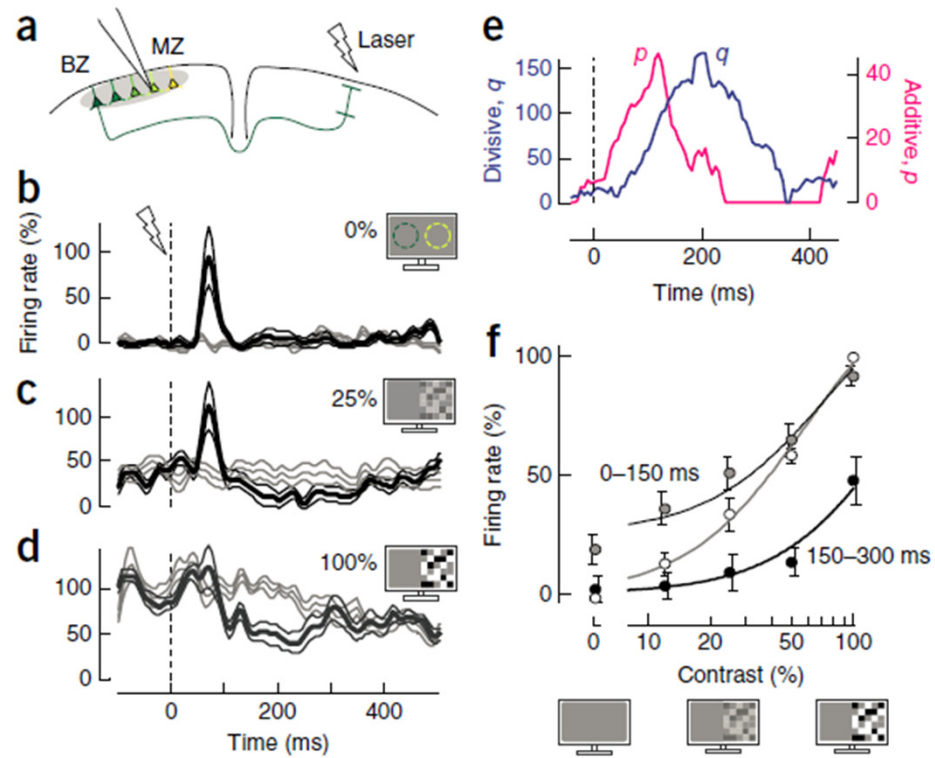
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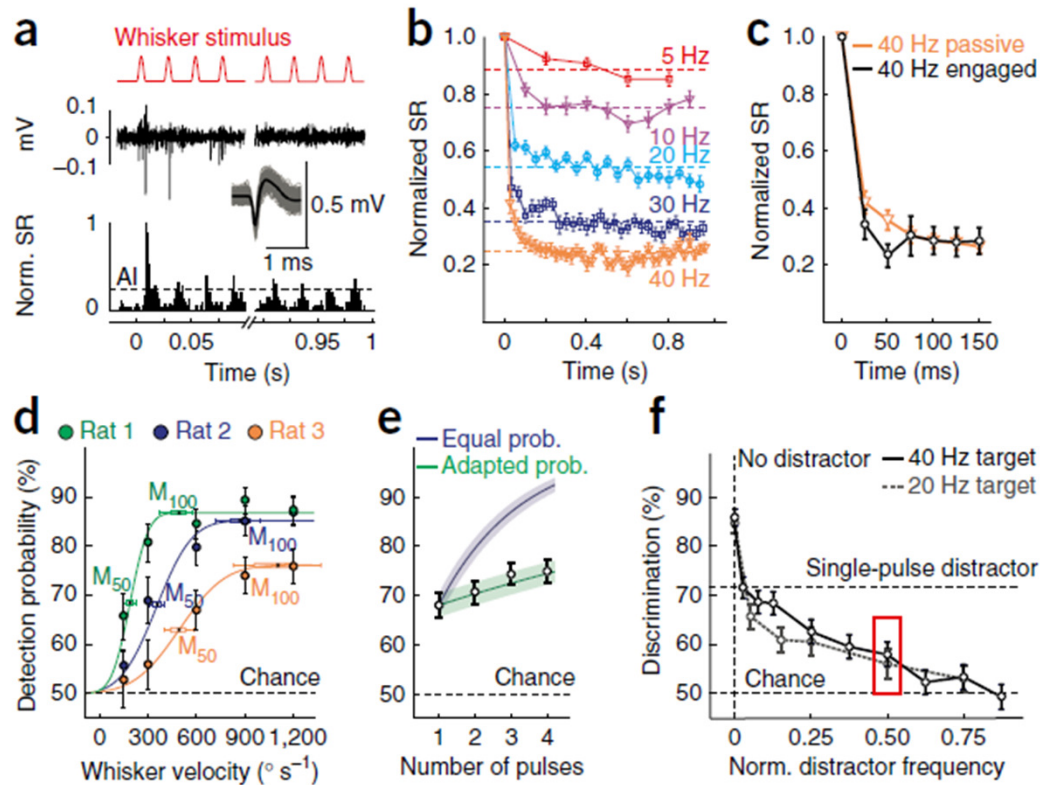
Multi-panel figures are common in high-impact journals

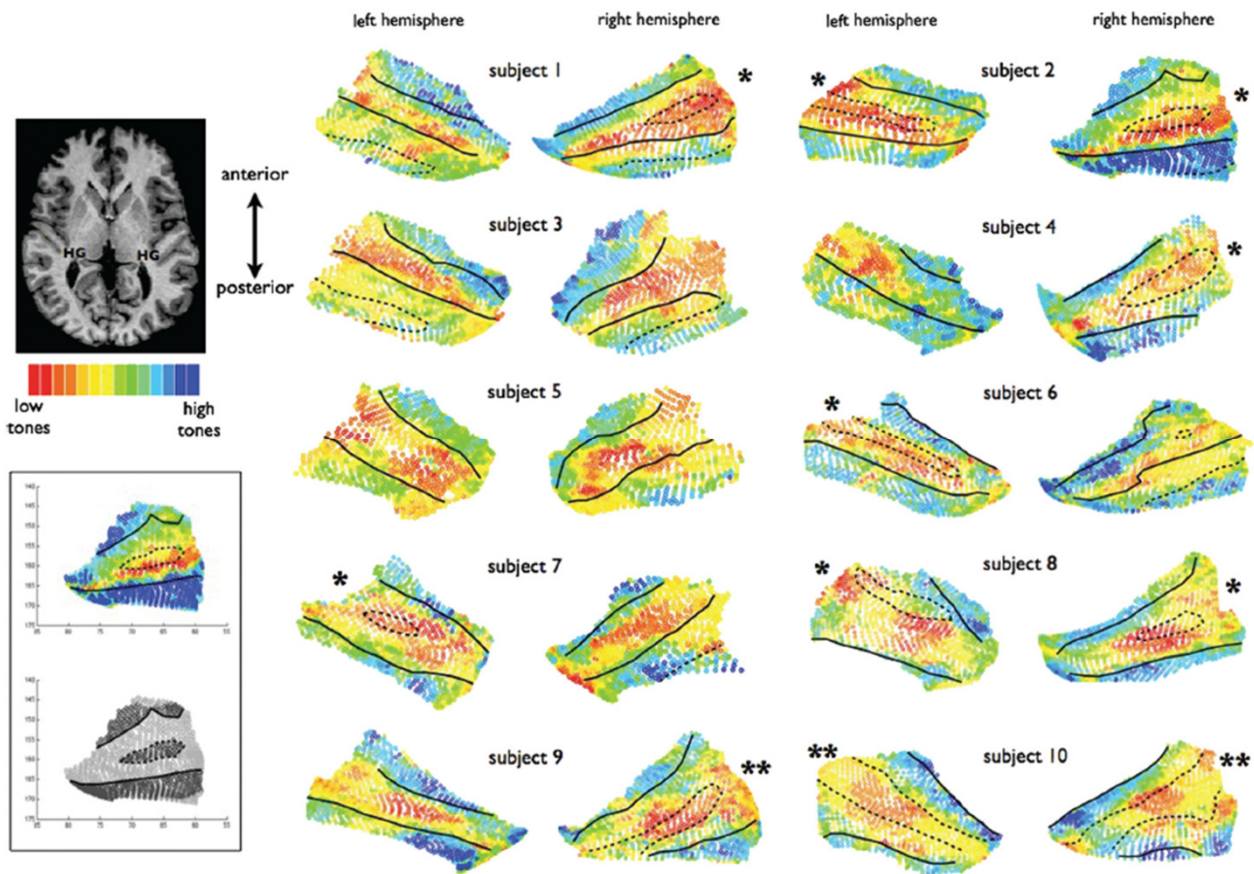
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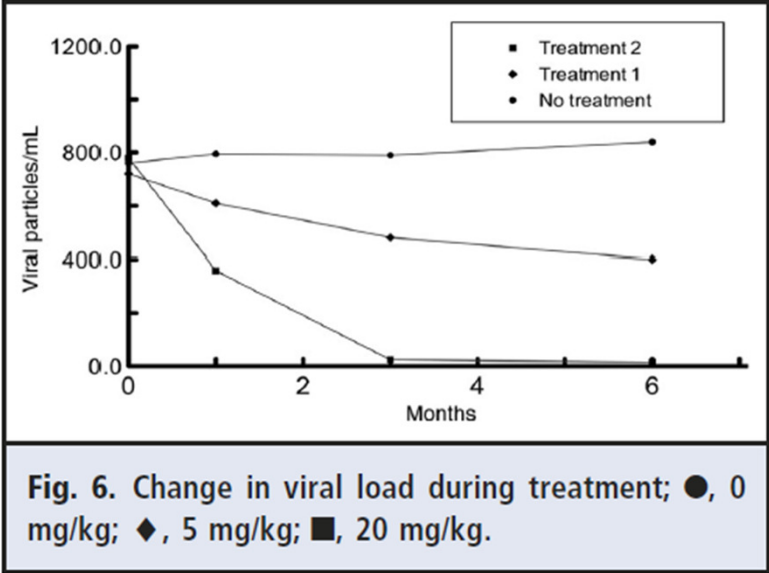


Example figures that could be improved

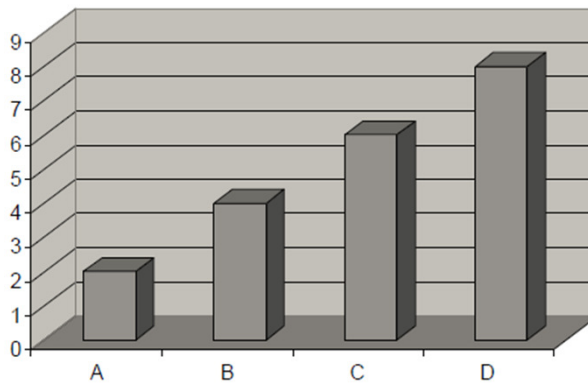
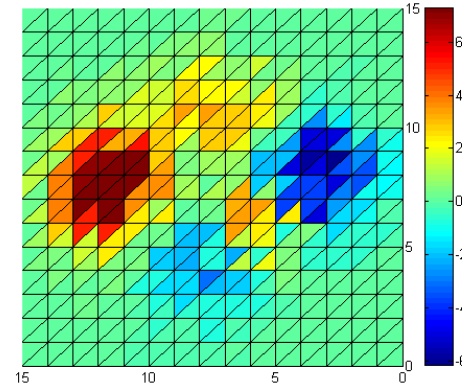
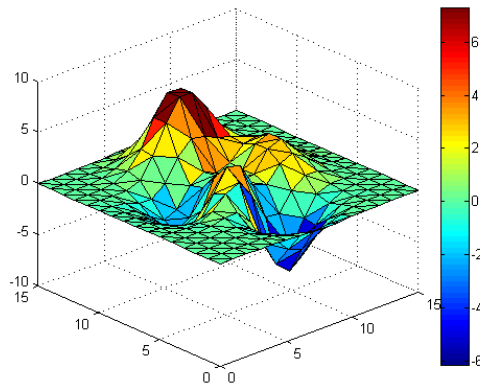
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Avoid unnecessary dimensions



Do not use too much or too little space

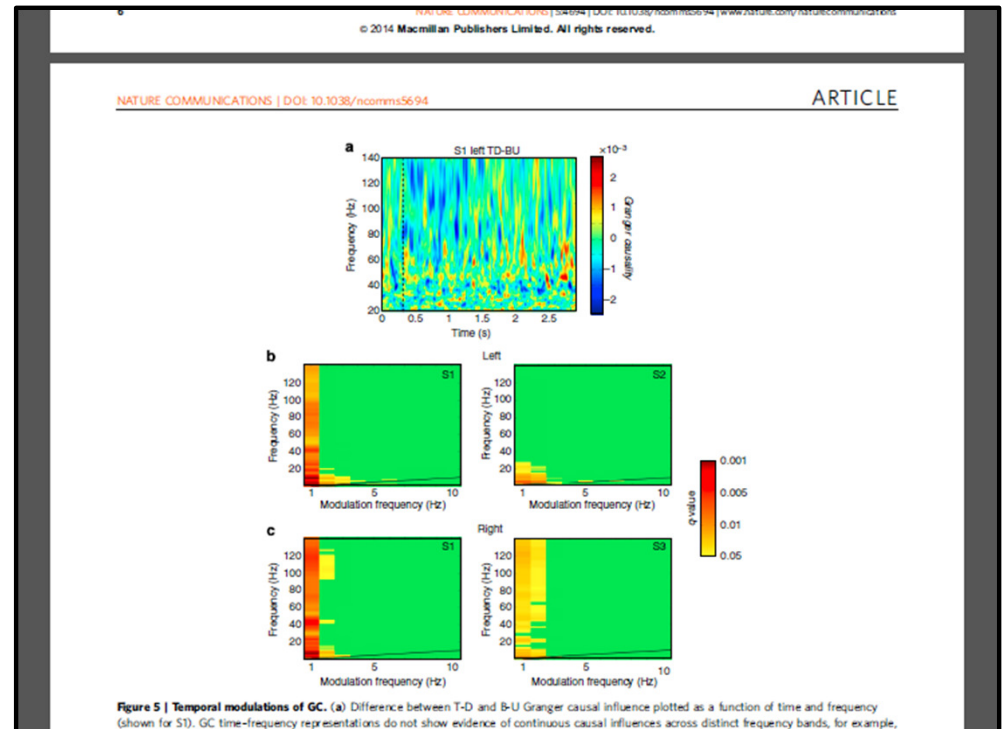
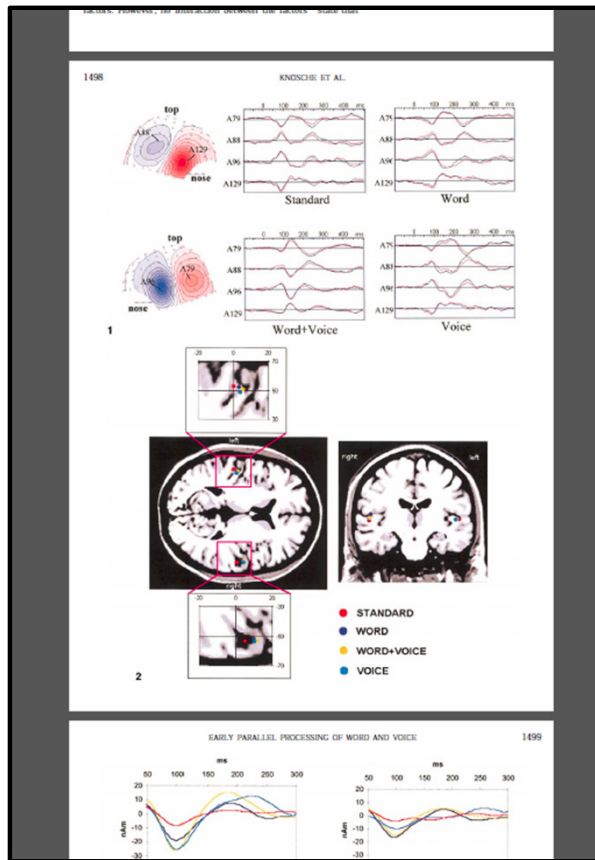
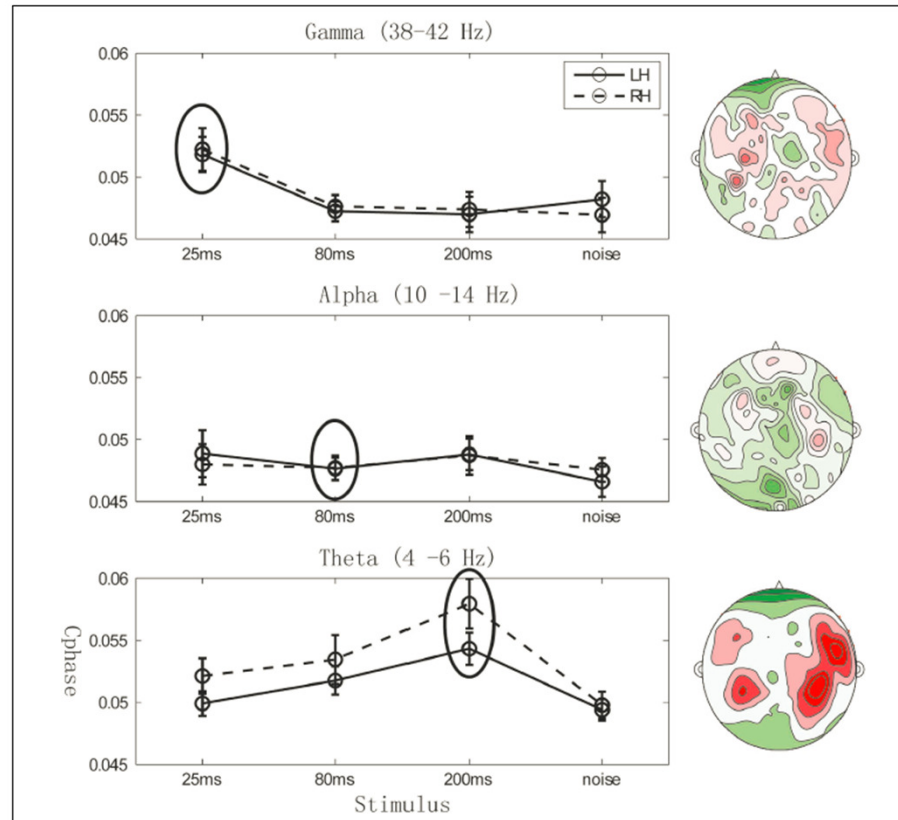


Figure 5 | Temporal modulations of GC. (a) Difference between T-D and B-U Granger causal influence plotted as a function of time and frequency (shown for S1). GC time-frequency representations do not show evidence of continuous causal influences across distinct frequency bands, for example.

Lots of space on the left and right

Figure is too long (caption on next page)

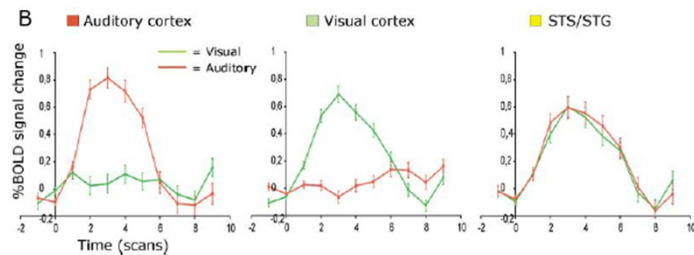
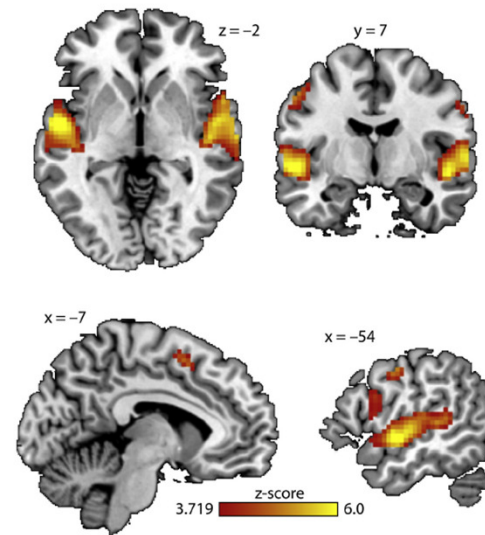
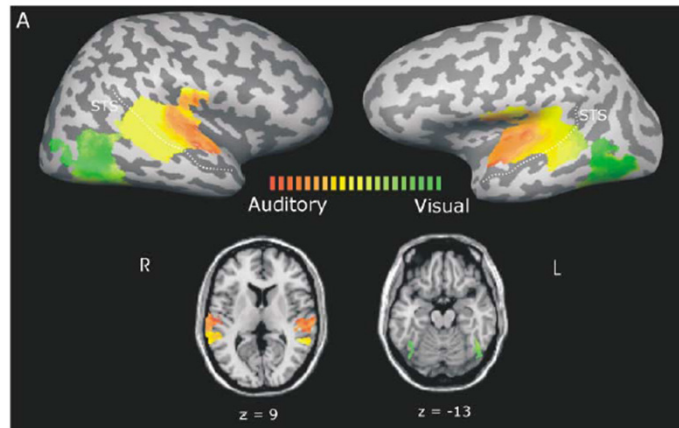
Provide all relevant information and be consistent



No colorbar; different font types are used

Consider having a white rather than a black background

Avoids use of unnecessary ink or toner powder if printed



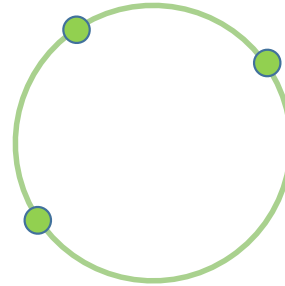
Vector graphics (Inkscape & Illustrator)

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Vector graphic vs. pixel graphic

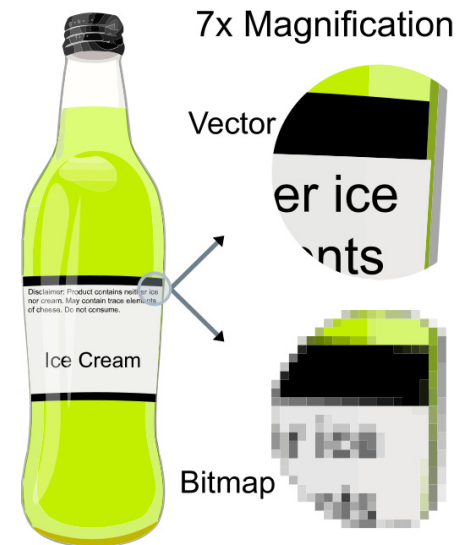


Vector graphics are based on a few (control) points

- Scalable *without* quality loss

Pixel graphics require the presence of all information

- Scalable *with* quality loss



Software to manipulate and create vector graphics

Inkscape



- Free
- Has all features available that are needed for our purposes

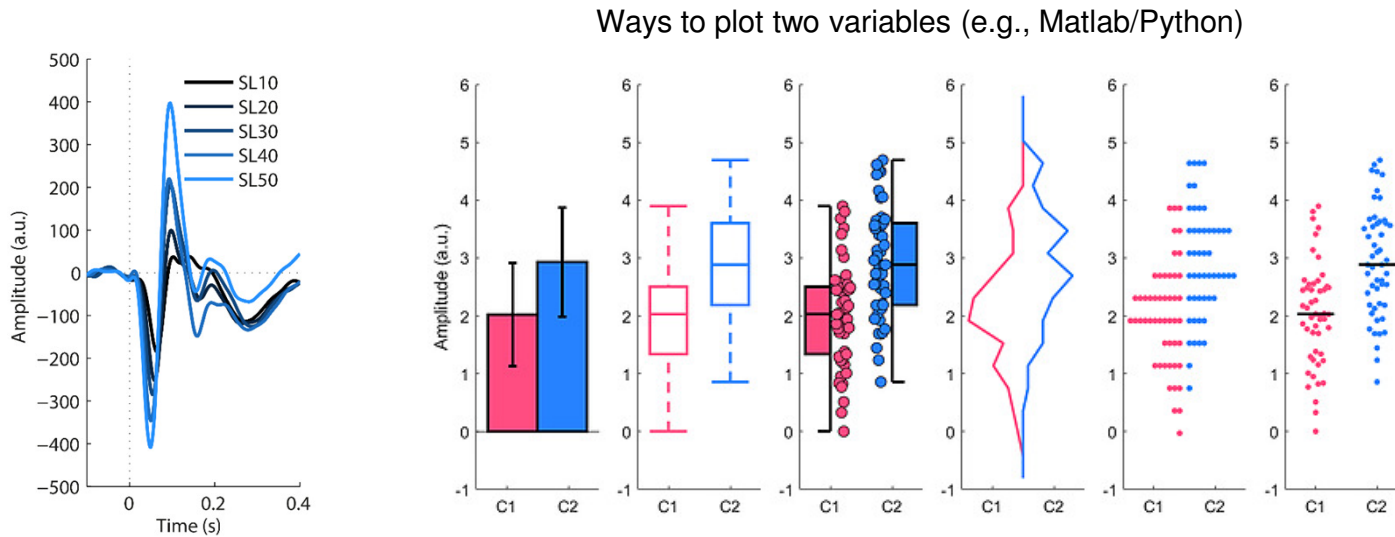
Adobe Illustrator



- Proprietary
- Potentially more powerful
- Feels more intuitive

Generate good plots first. Use Inkscape/Illustrator second.

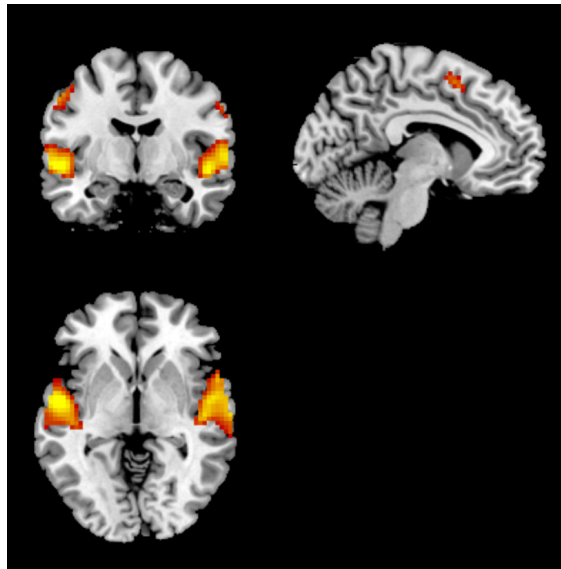
- Raw figures/plots are generated first using e.g., Matlab, Python, Excel, R
- Inkscape/Illustrator is useful for manipulating, integrating, and enhancing plots



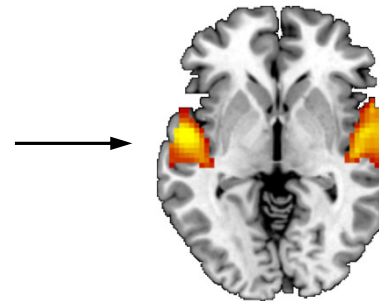
Inkscape/Illustrator: What it can do and what not

- Vector graphics program (Inkscape/Illustrator): Great for manipulating lines, surfaces, dots, areas etc.
- Inkscape/Illustrator can integrate pixel graphics, but CANNOT manipulate pixel graphics (use Gimp/Photoshop instead)

From some MRI viewer



Gimp/Photoshop
(or other software for pixel graphics)



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Figure size

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Build your figure in the correct, final size (in cm)

- Do not rescale your figure → Font size will change
- Choose 1 column vs. 2 columns and build the figure for this size (avoid wasting white space in the published paper)
- A two-column figure is better than a long one-column figure (less scrolling)

J Neuroscience:

- 1 column (maximum width 8.5 cm)
- 1.5 columns (maximum width 11.6 cm)
- 2 columns (maximum width 17.6 cm)

Summary

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- Aesthetics of scientific figures matters
 - Spend appropriate (more) time on figures
-
- Figure building is as important as writing a good paper section
 - Plotting your data in Matlab or Excel (or other software) precedes building the final figure in a vector graphics program (Inkscape/Illustrator)
 - Choose the figure size up-front
 - Make INFORMATIVE and BEAUTIFUL figures

Thank you

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This presentation and other info on aesthetics is available at <https://www.auditoryaging.com/scienceaesthetics>

Valuable information to look up later

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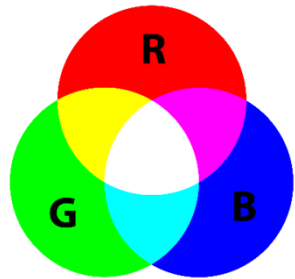
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What does RGB and CYMK mean?

RGB – red, green, blue

- Additive color model: Three colors are added in various ways (black = absence of light)
- Image display in electronic systems (e.g., computers)
- RGB differs slightly between devices (e.g., screens)



Range: 0–255

`[66 194 194]`

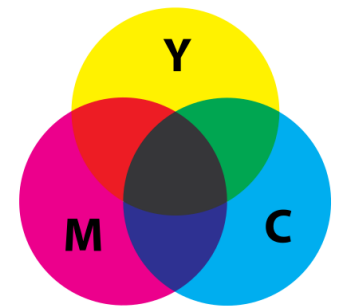
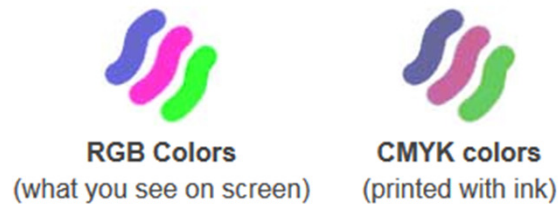
In Matlab:

Range: 0–1

`[66 194 194]/255`

CYMK – cyan, yellow, magenta, key (black)

- Subtractive color model: Masking colors on white background
- Used in color printing (e.g., paper, posters)



Color photographs do not suffer much from the RGB-CMYK conversion.

RGB files are converted to CMYK color for print.

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What do the different file formats mean?

Pixel graphics

- *.jpg – applies lossy compression to images, which can result in a significant reduction of the file size
- *.png – Portable Network Graphics supports lossless data compression (also supports transparency)
- *.bmp – bitmap image file; file size large; no data loss
- *.tiff – or tif; Tagged Image File Format; popular within the publishing industry; can do lossless data compression

Complex graphic file formats (support vector graphics)

- *.svg – Scalable Vector Graphic; vector graphic format
- *.eps – Encapsulated PostScript; can include pixel or vector data (widely used, but no longer evolves)
- *.pdf – Portable Document Format; encapsulates a complete description of a fixed-layout flat document, including the text, fonts, graphics, and other information needed to display it

Useful links

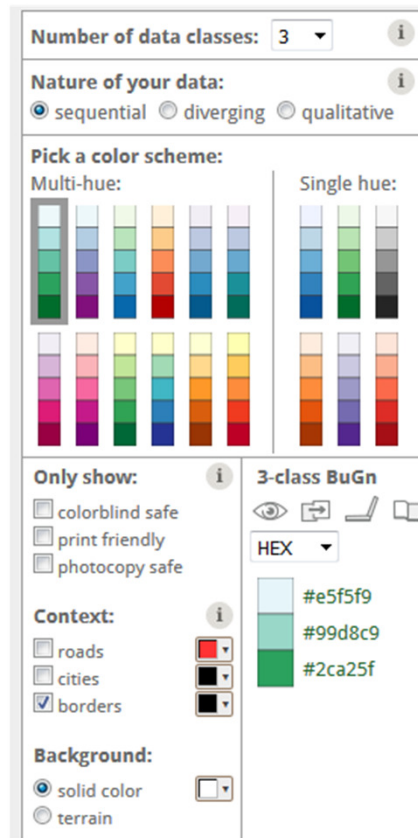
Adobe color wheel:

<https://color.adobe.com/>



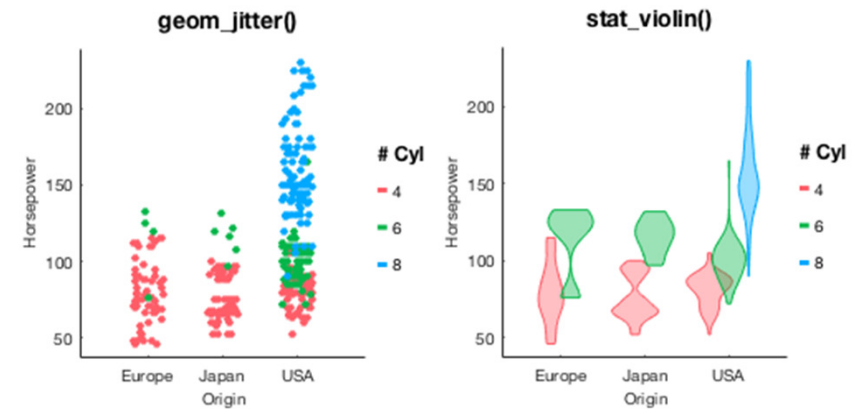
Inspiration for colorbars:

<http://colorbrewer2.org>



Matlab prettier plotting

- anneurai.net/2016/06/13/prettier-plots-in-matlab
- <https://github.com/piermorel/gramm>
- mathworks.com/products/matlab/plot-gallery.html
- <https://github.com/nejaz1/plotlib>



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