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THE UNIVERSITY OF IOWA

Scientific Editing and Research Communication Core

Achieving Clear Data Visualization

A major way that scientists communicate findings is by converting data into summaries (e.g., graphs, charts, and tables) and images (e.g., microscopy). Displaying data in a way that facilitates reader comprehension is essential for this form of communication. Below, we provide suggestions to achieve clear data visuals and identify common missteps that can mislead or distract a reader. Additionally, we provide a supplementary file with example figures that illustrate how to use these principles.

Overall

- Determine the central point you wish to convey with your visual.
  - If you need to make several points using the same data, consider making multiple summaries or images. E.g., if you have RNA sequencing data, avoid listing all differentially expressed genes in one enormous heatmap. Instead, make separate heatmaps for upregulated and downregulated transcripts or divide the genes into heatmaps associated with signaling pathways.
- Avoid default templates as they are usually not tailored to your central point.
- Include ample white space within and between your visuals.
- Keep visuals simple: avoid adding extraneous information.
- Ask many people for feedback.

Best Practices for Creating Data Summaries (Figure 1 in supplementary file)

Design

- Put the data on the same scale when comparing quantities (Fig. 1A).
- Select symbols that are easy to distinguish to indicate data points.
  - Hollow shapes (especially hollow circles) for data points are easiest to see when overlayed.
  - Crosses and circles are easily distinguished, whereas squares and diamonds are not (Fig. 1B).
- Vary an object's primary visual feature (e.g., color, size, or orientation) to emphasize a difference or finding (Fig. 1C).

Upcoming Opportunities

Have a question about writing grants or research articles? Contact us and we will attempt to answer it in a future newsletter.

Hardin Library Open Workshops: Endnote
October 3 | 1:00 pm–2:00 pm | Zoom (Online Version)
October 9 | 1:00 pm–2:00 pm | Zoom (Desktop Version)
EndNote is a reference management tool that helps you easily gather your references, organize them, insert them into papers, and format them in a style of your choosing. This session will walk you through the basics of using EndNote. The class will be hands-on and there will be time for questions at the end.
Additional information

UI Research Services Fair
October 12 | 1:00 pm–4:30 pm | IMU Main Lounge
The Research Services Fair (RSF) is a vendor-style fair that provides an opportunity for researchers and staff to learn about campus resources and services available for their research and scholarship activities. This year's RSF will host 65 campus units. Hors d'oeuvres and drinks will be available throughout the event.
Register here by October 9. *Registration is required to attend.*

- Use bar or axis breaks to make sure all data are readable (Fig. 1D); however, be sure breaks are labeled clearly and do not misrepresent data trends (e.g., data that are bimodal should not appear uniform).
- Use as little "ink" as possible (Fig. 1E).
  - Keep the line weight of axes small (0.5 pt).
  - Use as few ticks as possible.
  - Use grids and gridlines only when necessary to illustrate small differences in quantity.
  - Keep gridlines as light as possible (15%–45% opacity).
- Keep labels simple and short.
  - These are easiest to read when horizontal and should be in alignment and spaced equally (Fig. 1F).

Color

- Aim to use colors for categorical data, but not for quantitative data.
- Use color sparingly to highlight differences (Fig. 1G).
- Use colors that differ in hue, saturation, and brightness to effectively distinguish them (Fig. 1H).
- Employ colorblind-friendly color palettes using
  - preset color palettes found in many software packages or
  - online tools, such as www.colorbrewer2.org.
- Take into consideration that for quantitative data
  - surrounding colors influence our perception of color (Fig. 1I) and
  - small shifts in color are difficult to detect.

Common Mistakes

- Using too much color.
  - Other determinants (e.g., shape, size, and orientation) are usually more accurate for distinguishing differences.
- Including too many messages in one visual.
  - One central point per visual is easiest for readers.
- Using a font size that is too small.
  - Make sure your font is legible, especially after resizing the visual for publication.

Best Practices for Creating Images (Figures 2 and 3 in supplementary file)

Design

- Make sure to include the following components on your image.
  - Annotations (e.g., arrows, asterisks) and their definition in the figure legend; annotations can be used to clearly identify important structures (Fig. 2).
  - A clearly labeled scale bar (Fig. 3).
  - Labels to make it easy for the reader to interpret what is shown (e.g., treatment groups, what protein is being visualized, time points, etc.) (Fig. 3).
- Align images in columns, rows, or groups in order to associate them and help the reader draw comparisons. Be sure to label what defines each group (Fig. 3).

Maximizing Pivot to Find Funding and Collaborators
October 17 | 11:00 am–12:00 pm | Zoom
Do you want to maximize your time spent searching for funding opportunities or potential project collaborators? Join us on an upcoming date below to learn how Pivot can save you time and effort in identifying the right funding opportunities for your research, as well as in identifying collaborators with the relevant expertise.
Additional information
Register here for the October 17 session.

NIH K Club+
In collaboration with the Institute for Clinical and Translational Science's K Club, the NIH K Club+ is designed to give eligible Assistant Professors and postdocs the knowledge and resources to craft competitive K award applications. Club participants will take part in events and services including editing and review services.
Additional information
Register here by October 20 to participate in the NIH K Club+.

Write Winning Grant Proposals Seminar
October 26 | 8:30 am–5:00 pm | IMU Ballroom
The RDO is pleased to partner with Grant Writers' Seminars & Workshops (GWSW) on this seminar. Registration fee is $150 (includes seminar, workbook, supplemental materials, and lunch). Each college sponsors a certain number of faculty spots on a first-come, first-served basis. In-person and virtual options are available.
Additional information
Register here by October 8.

Ask the Grant Writing Expert
A 30-minute recorded video from Dr. Meg Bouvier that provides practical training on common grant-writing tips and tricks. Each video has been time-stamped and indexed to enable easy navigation to a variety of grant writing topics, many specific to the NIH.
Access the recordings here

- Avoid abbreviations when possible or define them in the figure legend.

Color

- Consider using grayscale, which may allow readers to more easily differentiate details.
- Choose colors with colorblindness in mind.
  - Red-green colorblindness is common, so consider using magenta instead of red or teal instead of green.
  - Online tools (e.g., www.colororacle.org) can help you choose effective color combinations.
- Show color channels separately alongside a merged image (Fig. 3).

Common Mistakes

- Magnification is insufficient for readers to see the structure or staining.
  - Use clearly labeled insets to help readers see your observation.
- Scale bar is missing, blends into background, or is not identified.
  - Position the scale bar in a consistent location and use a color that makes it "pop" out of the image.

Best of luck designing your visualizations!
Cami Hippee (Scientific Editing Intern) and the SERCC editing team

References and Resources

1. Supplementary File of Example Figures
2. https://blogs.nature.com/methagora/2013/07/data-visualization-points-of-view.htm
3. https://journals.plos.org/ploscompbiol/article?id=10.1371/journal.pcbi.100383
4. https://journals.plos.org/plosbiology/article?id=10.1371/journal.pbio.300116
5. https://www.clips.edu.au/displaying-data/

NIH Application Instruction Updates for Data Management and Sharing (DMS) Costs
The notice, NOT-OD-23-161, updates the NIH application instructions for submitting requests for DMS costs in a single line item. Effective for applications submitted for due dates on or after October 5, 2023, NIH will no longer require use of the single DMS cost line item. Instead, institutions must request DMS costs in the appropriate cost category, e.g., personnel, equipment, supplies, and other expenses and by following the instructions for the R&R Budget Form or PHS 398 Modular Budget Form, as applicable.
Read the Full NIH Announcement

OVPR Resource Library: Learn from Successful Examples
Find examples of successful proposals to various funding agencies.
View examples. *Note: HawkID authentication required.*

RDO Networking Surveys
To help facilitate networking and collaborations, the RDO has developed Networking Surveys. Networking surveys create a directory to help identify potential collaborators for your ideas and projects.
Complete the survey and see the results

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