

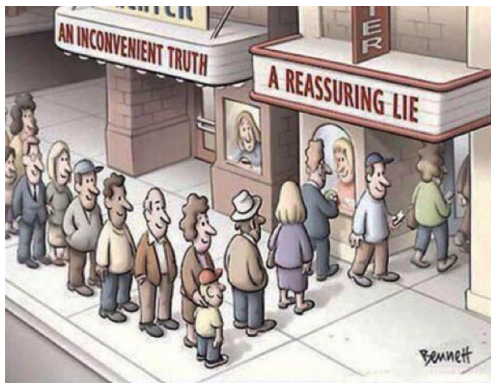


The multiverse approach for a better data analysis in developmental psychophysiology: the case of pupillometry

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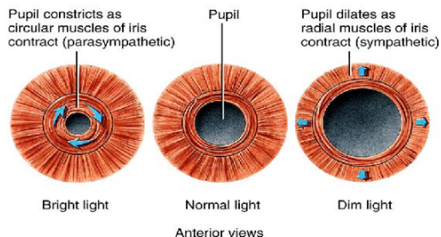
We rarely find data, we actively construct datasets



- A single data collection = a multiverse of possible datasets

(Steege et al., 2016)

Psychophysiology of pupil dilation in infancy



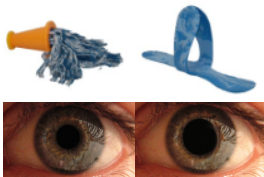
- The dilator muscle is under adrenergic control (sympathetic system) from the superior sympathetic ganglion
- The sphincter pupillae innervated by cholinergic fibers of the parasympathetic system
- **Dilation = activation of the sympathetic system + a parallel inhibitory parasympathetic mechanism**

(Beatty & Lucero-Wagoner 2000)

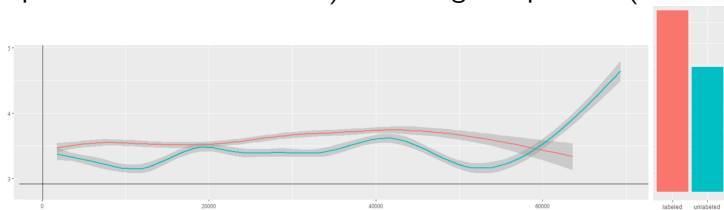


Degrees of freedom in pupil analysis

- Luminance variation VS. attentional resources



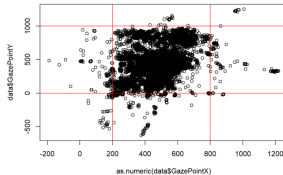
- Pupil variation across time :) vs average barplot ?! :(



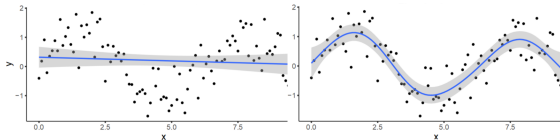
(Calignano, Valenza, Vespignani, Russo & Sulpizio, 2021)

Degrees of freedom in pupil analysis

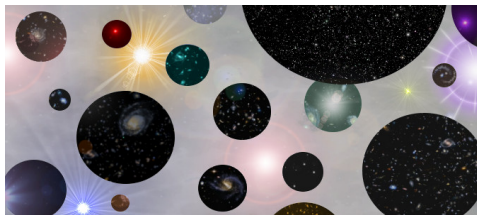
- Area of Interest (AOI) and implausible values e.g. outliers



- Baseline correction **!big issue in psychophysiology!**
- Statistical modeling **do not forget individual variability!**



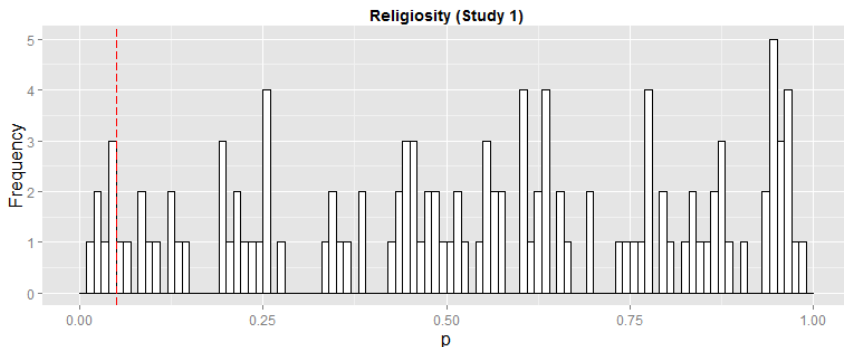
A Multiverse approach



- **a philosophy of statistical reporting** in the manuscript (not in the supplementary materials) the outcomes of many different statistical analyses showing how robust findings are (Dragicevic, et al.,2019)
- **robustness of a finding** across different options for all steps in data processing (Steegeen et al., 2016).

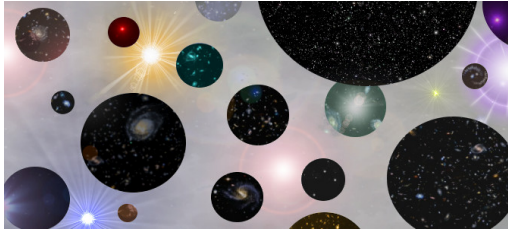
A Multiverse approach

- is the effect **robust** or is it driven by data processing choices?
- there is a multiverse of statistical results



(Steege et al., 2016)

Building a reliable Psychophysiology and Cognitive Neuroscience

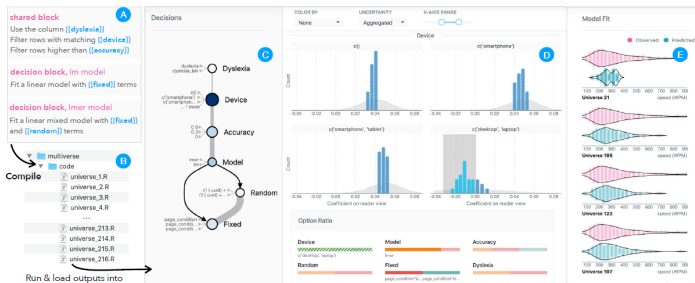


- **Importance of embracing (rather than be afraid of) the uncertainty in data**
- Data sharing and caring contribute to a full-multiverse approach

Open Tools

Boba: Authoring and Visualizing Multiverse Analyses

Yang Liu, Alex Kale, Tim Althoff, and Jeffrey Heer



Open tools and resources

- R Core Team (2020). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL <https://www.R-project.org/>
- **coming soon**
A multiverse approach for better developmental science: The case of pupil size variation as index of attention deployment
Calignano, G., Girardi, P., Altoè, G., (in prep.)

Resources

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Resources

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Thank you



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