A Longitudinal Analysis of the Synchronized Brainwave Dataset

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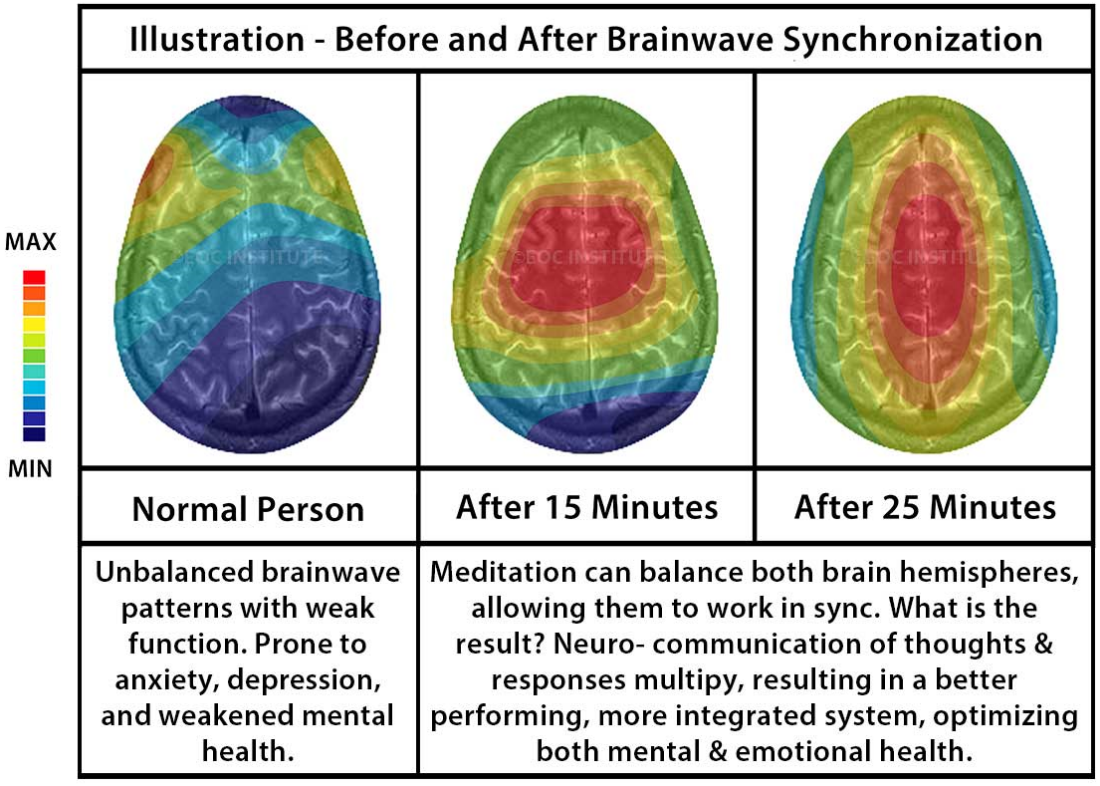
12/7/2016

Inspiration

- Has been a growing interest over recent years to further understand the brain's ability to comprehend information at a faster rate
- Researchers at MIT performed an experiment on Monkeys where they discovered that synchronized brain waves enable rapid learning. (Trafton 2014)



Introduction

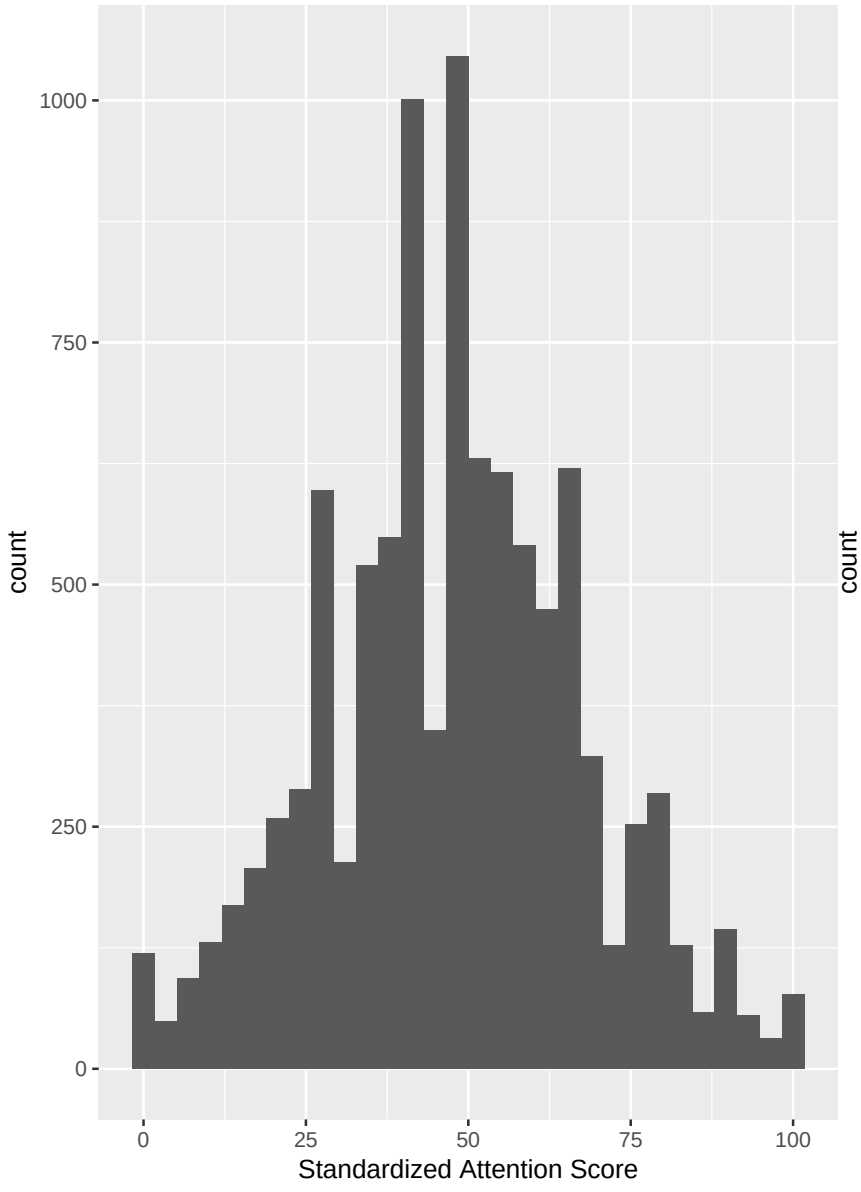
- As a next step, we thought it would be intriguing to explore this idea further by investigating how ones' brain waves can be manipulated to maintain a synchronized neurological state so that cognitive function is optimized.
- To do this we analyzed EEG data collected on subjects exposed to different stimuli.

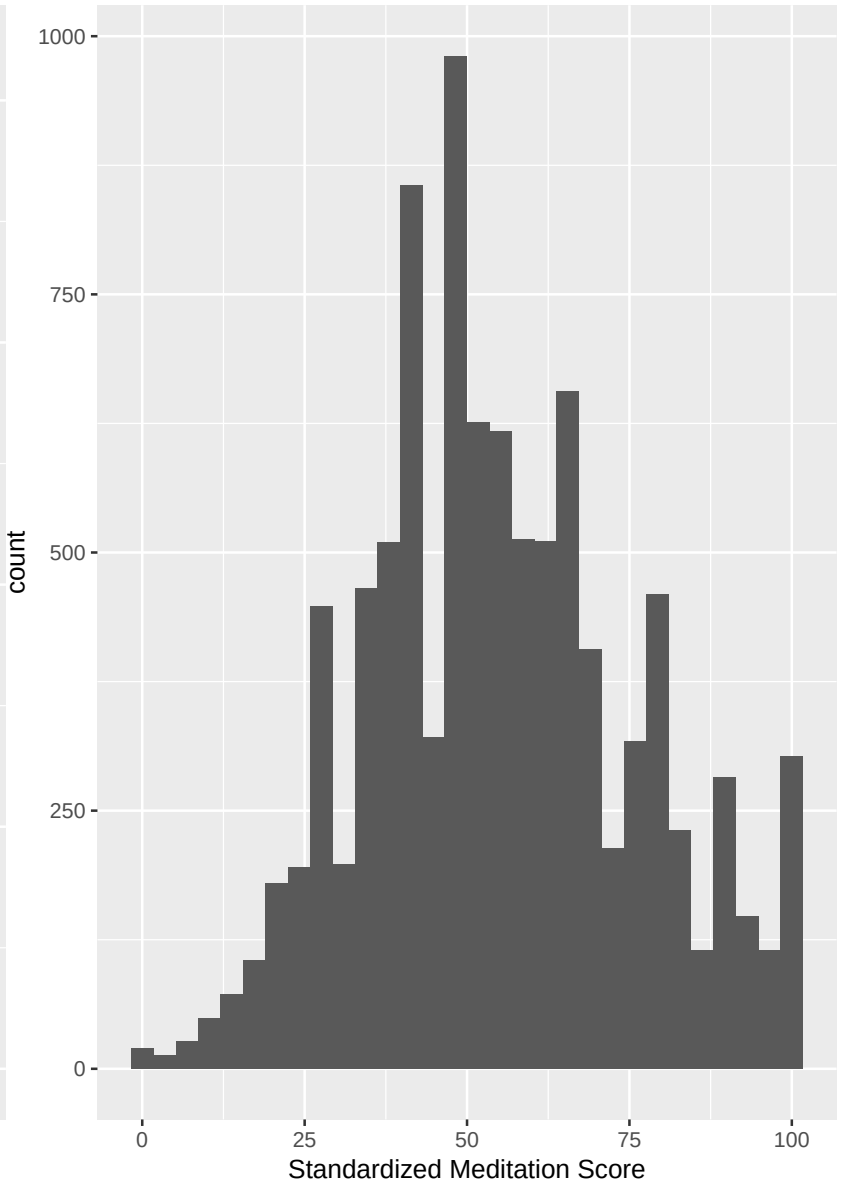
Background

- Study involved 30 voluntary students from UC Berkeley.
- Participants where randomly assigned to watch one of the two stimulus videos (both videos where 5 minutes and 19 seconds long).
- Everyone was hooked up to an Electroencephalography (EEG) which recorded electrical brain activity as they viewed the video and followed the instructions.

Smoothed Trajectories by Subject

Distribition of Responses





Model

$$\begin{pmatrix} \mathbf{Y_{1i}} \\ \mathbf{Y_{2i}} \end{pmatrix} = \mathbf{X_i}^T \begin{pmatrix} \beta_{1i} \\ \beta_{2i} \end{pmatrix} + \mathbf{Z_i}^T \begin{pmatrix} \boldsymbol{b_{1i}} \\ \boldsymbol{b_{2i}} \end{pmatrix} + \begin{pmatrix} \epsilon_{1i} \\ \epsilon_{2i} \end{pmatrix}$$

- *Responses*: Attention, Meditation
- *Fixed Effects*: Intercept, Session, Gender, Color, Time, Hidden Icons, Previous Exposure to Ad
- *Random Effects*: Intercept, Time

Results

	post.mean	l-95% CI	u-95% CI	eff.samp	pMCMC
traitattention_esense	53.14	51.35	55.41	1000.00	0.00
traitmeditation_esense	60.43	58.14	62.20	1000.00	0.00
Genderm	-3.86	-5.34	-2.53	1000.00	0.00
Seen.video.before.y	-2.11	-3.54	-0.63	1000.00	0.01
Saw.icons.n	1.40	-0.12	2.95	1000.00	0.09
Saw.icons.smiley	-5.17	-6.93	-3.26	1052.77	0.00
Saw.icons.star	-9.28	-12.47	-6.47	1230.84	0.00
Chosen.colorg	-2.42	-3.79	-1.03	1109.25	0.00
Chosen.colorr	-1.74	-3.02	-0.38	1000.00	0.01
Chosen.colory	-0.43	-3.35	2.20	1000.00	0.76
time	-0.01	-0.03	0.00	1111.00	0.06
as.factor(Session)2	3.48	2.39	4.46	1251.01	0.00
time:as.factor(Session)2	-0.01	-0.03	0.01	1110.97	0.56

References

Trafton, Anne. 2014. "Synchronized Brain Waves Enable Rapid Learning." *MIT NEWS on Campus and Around the World*.