The Art and Science of Meditation

SPLASH! Nov. 24, 2019. Teacher: Aaron Schwartz

Agenda

- Introduction (5 min)
- Art (20 min)
- Science (15 min)
- Conclusion & Questions (10 min)

Introduction

Goals

- **Goal 1:** Spark an interest in meditation and mindfulness
- **Goal 2:** Learn how scientists perform experiments and communicate results
- **Goal 3:** Show you that you CAN establish a daily practice!

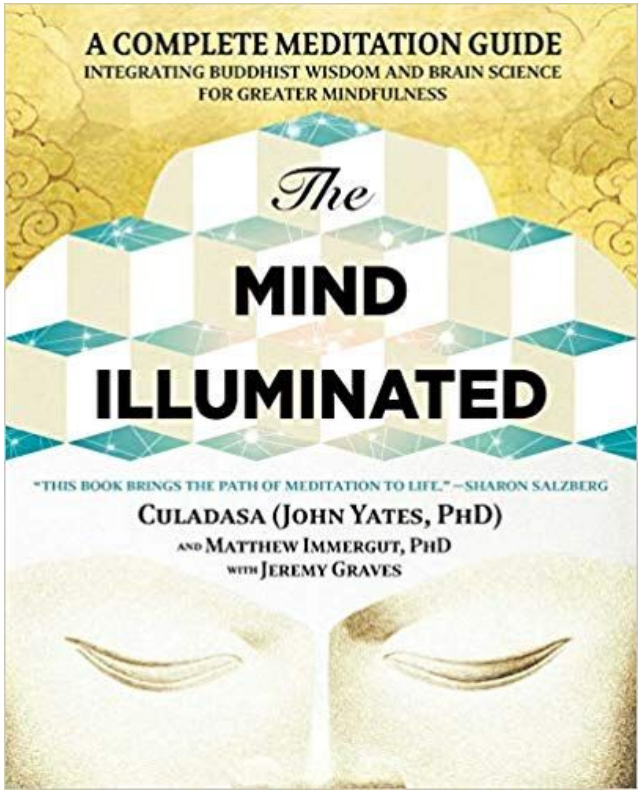
Your Teacher

- Aaron Schwartz
- 1st Year Master's student in the MIT Technology and Policy Program
- **I'm a beginner like you!**
- 1st time ever meditating was this past July in Cambodia
- Other interests include seeing and making music, yoga and hiking

How did you spend your 5 minutes?

The art of Meditation

What is Meditation?



What is Meditation?

"Meditation is the *art* of fully conscious living"

What is Meditation?

What makes something scientific?

What is Meditation?

“Meditation is a science, the systematic process of training the mind. **It is the *science* of meditation that allows people from all walks of life to experience the same amazing benefits”**

“[Meditation] is a science in the sense that it is **objectively verifiable through repeated testing and replication of results**. Everyone who accurately performs the same ‘experiment’ in meditation reports the same results”

What is Meditation?

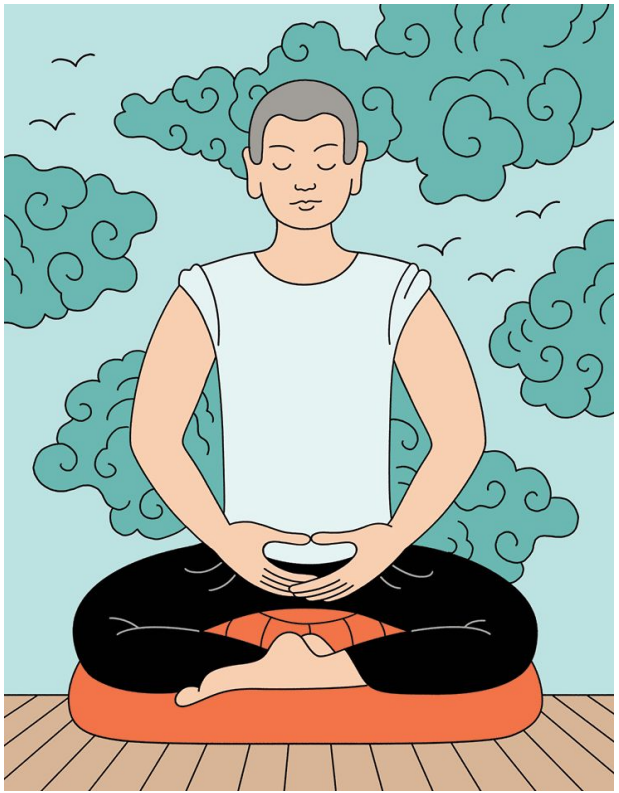
The best way to learn,
is to DO!

Zazen

- Zen Buddhism - originated in China, and spread to Japan, Vietnam, and Korea
- The word *Zen* is derived from the Sanskrit word for “quiet contemplation”
- “**The aim of zazen is just sitting**, that is, suspending all judgmental thinking and letting words, ideas, images and thoughts pass by without getting involved in them”

Zazen

- “First we assume the correct posture...
- ...next we focus on our breathing...
- ...and finally we steady our mind.
- Once we arrange all three of these things, then we begin to practice zazen”



Zazen

Let it COME

Let it BE

Let it GO

Zazen

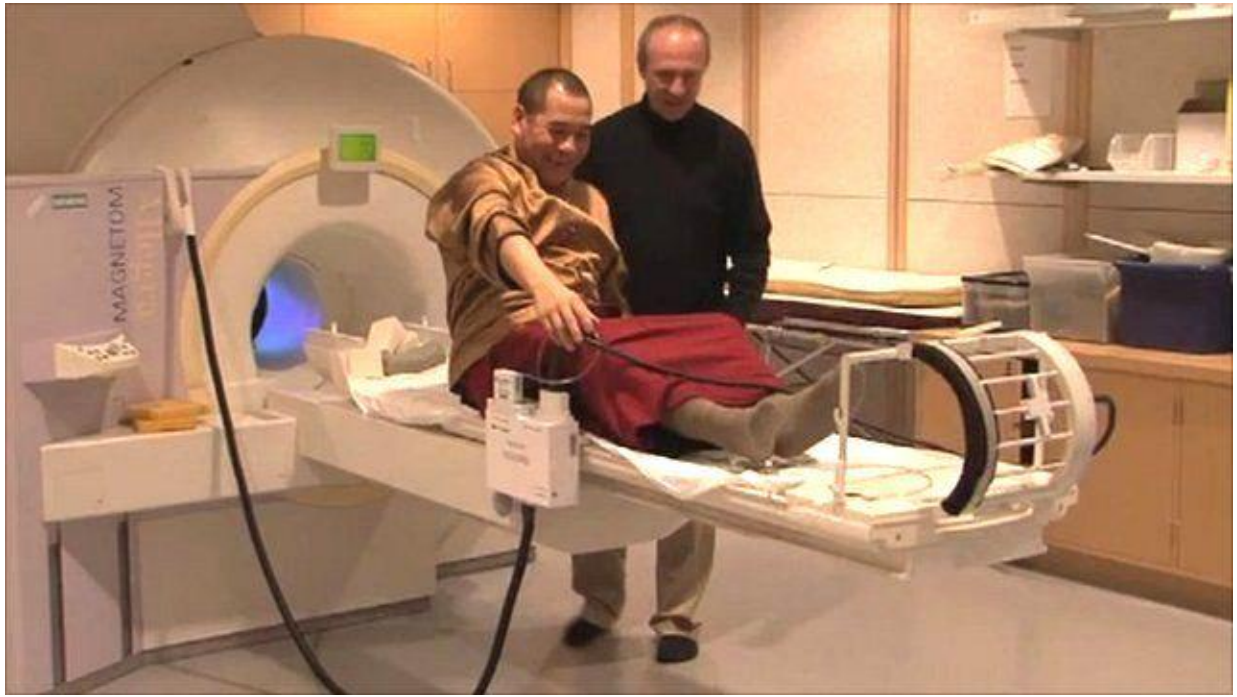
CONGRATULATIONS! You just had a GREAT Meditation!

The Science of Meditation

Scientific Literature on Meditation

- I recently came across this meditation guide...
- ***“The Ultimate User's Guide To Clearing Negative Energy & Raising Positive Vibration Through Meditation”***
- ...personally, I’d want something a bit more scientific :)

Meditation and Your Brain



Meditation and Your Brain

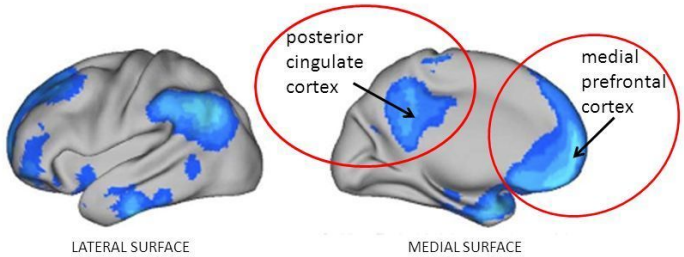
- “Influence of meditation on anti-correlated networks in the brain”
  - Josipovic Z, Dinstein I, Weber J and Heeger DJ (2012) Influence of meditation on anticorrelated networks in the brain. Front. Hum. Neurosci. 5:183.
- Used fMRI brain scans of skilled monks when meditating and not meditating
- Studied the effects of two different types of meditation on two different brain networks
- **Meditation may allow “competing” parts of the brain to work better together**

Meditation and Your Brain

- Intrinsic System AKA Default Mode Network
  - Associated with mind-wandering, sense of self, thinking about past/future, etc.
- Extrinsic System
  - Associated with sensory and motor systems
- These systems are usually “anti-correlated”, i.e. when one is active, the other is passive

Default Mode Network

Meta-analysis of brain regions more active at “rest” than during task



Buckner et al, *Ann NY Acad Sci*, 2008

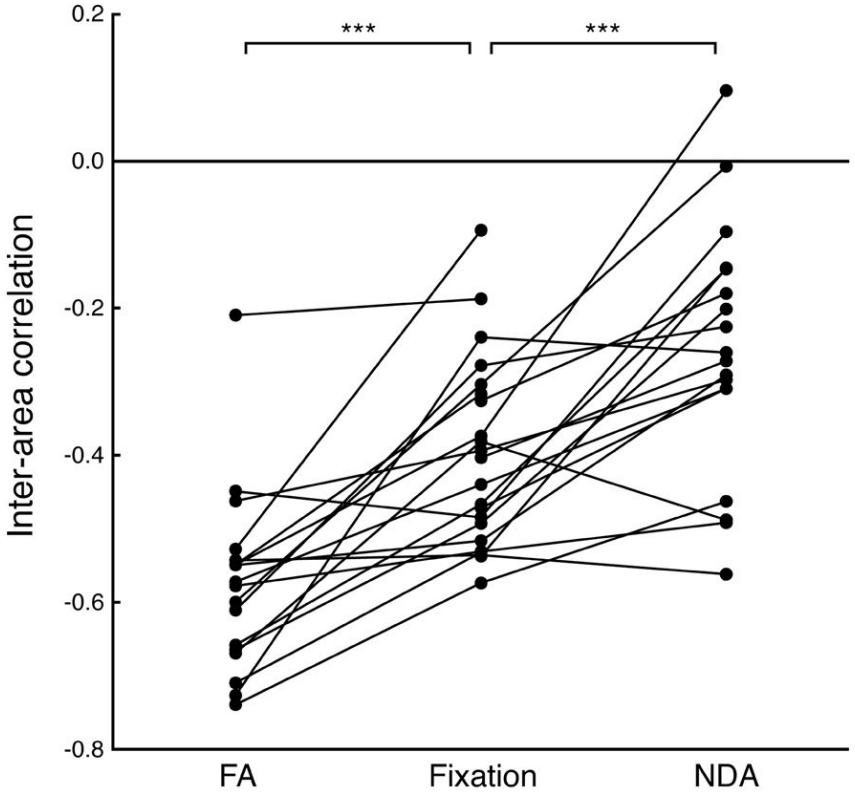
Definition: a specific, anatomically defined brain system preferentially active when individuals are left to think to themselves undisturbed

Meditation and Your Brain

- Focused Attention Meditation (FA)
  - “Keep a steady focus on the object of meditation, the fixation point, to the exclusion of other mental content, and if thoughts arise do not follow them but remain focused on the fixation point. If your mind wanders off, bring it back gently to the object of focus.”
- Non-Dual Awareness Meditation (NDA)
  - “Rest in reflexive NDA, equally aware of inside and outside of your body, allowing experiences to arise and subside of their own accord.”
- **Which meditation type do you think activates which brain network?**

Meditation and Your Brain

- Compared to a baseline, non-meditation state (fixation), FA led to increased anti-correlation, and NDA led to decreased anti-correlation



Meditation and Wellness

- “Meditation Programs for Psychological Stress and Well-being: A Systematic Review and Meta-analysis
  - Goyal M, Singh S, Sibinga EMS, et al. Meditation Programs for Psychological Stress and Well-being: A Systematic Review and Meta-analysis. JAMA Intern Med. 2014;174(3):357-368.
- “Meta-review” of existing literature on meditation, looking to understand the current scientific consensus on “stress-related outcomes”
- **“Our review indicates that meditation programs can reduce the negative dimensions of psychological stress”**

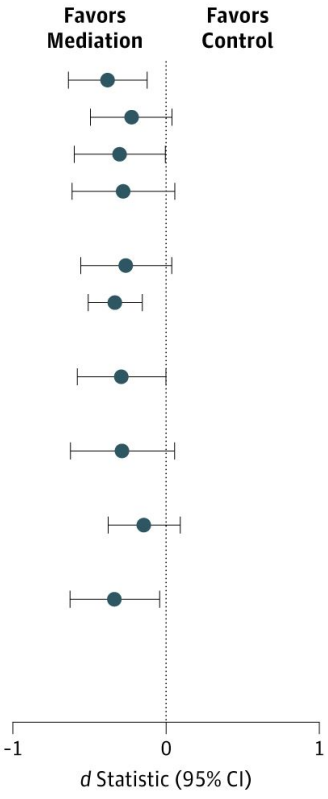
Meditation and Wellness

- Literature review considered **randomized clinical trials** with a **control group** to account for **placebo effects**
  - Control group given near equal time/ attention than treatment group
- Included 43 trials with 3515 total participants
- Many of the studies included were short-term studies (eg, 2.5 h/wk for 8 weeks)
  - “Long-term trials may be optimal to examine the effect of meditation on many health outcomes...and the participants likely did not achieve a level of expertise needed to improve outcomes that depend on mastery of mental and emotional processes.”
- All trials considered participants with a “clinical” condition
  - Mental health, physical health, or clinical stress

Meditation and Wellness

A Comparisons of Meditation Programs With Nonspecific Active Controls (Efficacy)

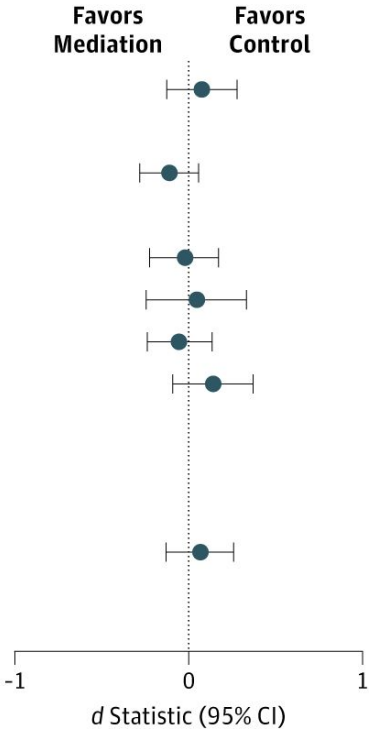
Outcome	Meditation Program	Clinical Population	No. of Trials, Total (PO); PA (MA)	Direction (Magnitude) of Effect	Strength of Evidence
Anxiety	Mindfulness	Various (n = 647)	8 (3); 7 (7)	↑(0% to +44%)	Moderate for improvement
	Mantra	Various (n = 237)	3 (2); 3 (3)	Ø (-3% to +6%)	Low for no effect
Depression	Mindfulness	Various (n = 806)	10 (4); 9 (8)	↑(-5% to +52%)	Moderate for improvement
	Mantra	Various (n = 440)	5 (1); 5 (3)	↑↓(-19% to +46%)	Insufficient
Stress/Distress	Mindfulness	Various (n = 735)[a]	9 (4); 8 (7)	↑(+1% to +21%)	Low for improvement
	Mantra	Select (n = 239)	4 (2); 4 (2)	Ø (-6% to +1%)	Low for no effect
Negative Affect	Mindfulness	Various (n = 1140)[b]	14 (5); 12 (11)	↑(-1% to +44%)	Low for improvement
	Mantra	Various (n = 438)[c]	5 (2); 5 (0)	↑↓(-3% to +46%)	Insufficient
Positive Affect	Mindfulness	Various (n = 293)	4 (0); 4 (4)	↑(+1% to +55%)	Insufficient
	TM (mantra)	CHF (n = 23)	1 (0); 1 (0)	Ø (+2%)	Insufficient
Quality of Life	Mindfulness	Various (n = 346)	4 (2); 4 (3)	↑(+5% to +28%)	Low for improvement
Attention	Mindfulness	Caregivers (n = 21)	1 (0); 1 (0)	↑(+15% to +81%)	Insufficient
Sleep	Mindfulness	Various (n = 578)	6 (2); 4 (4)	↑↓(-3% to +24%)	Insufficient
Substance Use	TM	CAD (n = 201)	1 (0); 0 (0)	Ø	Insufficient
Pain	Mindfulness	Select (n = 341)	4 (2); 4 (4)	↑(+5% to +31%)	Moderate for improvement
	TM (mantra)	CHF (n = 23)	1 (0); 1 (0)	Ø (-2%)	Low for no effect
Weight	TM (mantra)	Select (n = 297)	3 (0); 2 (0)	Ø (-1% to +2%)	Low for no effect



Meditation and Wellness

B Comparisons of Meditation Programs With Specific Active Controls (Comparative Effectiveness)

Outcome	Meditation Program	Clinical Population	No. of Trials, Total (PO); PA (MA)	Direction (Magnitude) of Effect	Strength of Evidence
Anxiety	Mindfulness	Various (n = 691)	11 (6); 11 (10)	↑↓(-39% to +8%)	Insufficient
	CSM (mantra)	Anxiety (n = 42)	1 (1); 1 (0)	↓(-6%)	Insufficient
Depression	Mindfulness	Various (n = 986)	13 (6); 13 (11)	↑↓(-32% to +23%)	Insufficient
	CSM (mantra)	Anxiety (n = 42)	1 (1); 1 (0)	↓(-28%)	Insufficient
Stress/Distress	Mindfulness	Various (n = 523)	7 (5); 7 (6)	↑↓(-24% to +18%)	Insufficient
Positive Affect	Mindfulness	Various (n = 297)	4 (2); 4 (4)	↑↓(-45% to +10%)	Insufficient
Quality of Life	Mindfulness	Various (n = 472)	6 (1); 6 (5)	↑↓(-23% to +9%)	Insufficient
Sleep	Mindfulness	Various (n = 311)	3 (1); 3 (2)	↑↓(-2% to +15%)	Insufficient
Eating	Mindfulness	Select (n = 158)	2 (1); 2 (0)	↓(-6% to -15%)	Insufficient
Smoking/Alcohol	Mindfulness	Substance abuse (n = 95)	2 (2); 1 (0)	↑(Ø to +21%)	Insufficient
Alcohol only	Mantra	Alcoholic (n = 145)	2 (2); 2 (0)	Ø(-5% to -36%)	Low for no effect
Pain	Mindfulness	Select (n = 410)	4 (2); 4 (4)	Ø(-1% to -32%)	Low for no effect
Weight	Mindfulness	Select (n = 151)	2 (2); 2 (0)	Ø(-2% to +1%)	Low for no effect



Meditation and Wellness

- **Moderate evidence** of improved anxiety, depression, and pain
- **Low evidence** of improved stress/distress and mental health-related quality of life
- **Low evidence of no effect or insufficient evidence of any effect** of meditation programs on positive mood, attention, substance use, eating habits, sleep, and weight
- Does the type of meditation practice matter? **Yes!**
  - No low or insufficient evidence of reduction of negative outcomes for Mantra Meditation studies

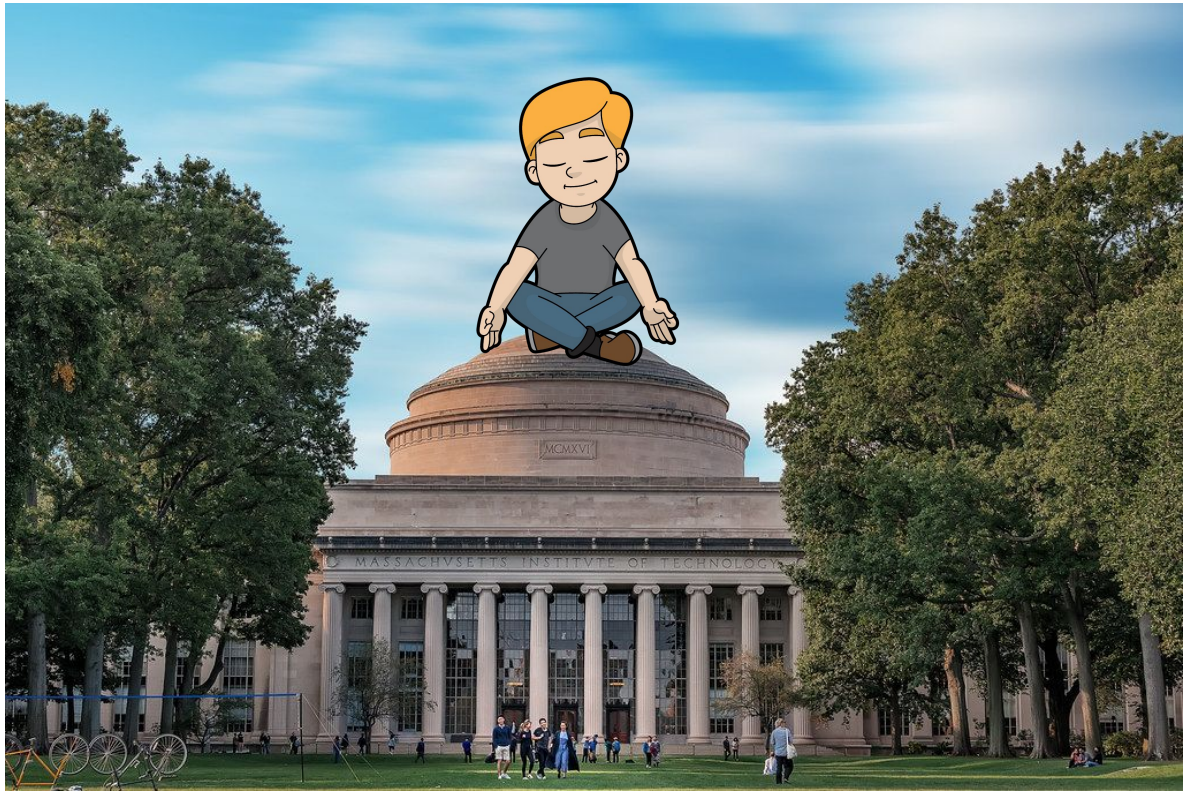
Conclusion

Zen Mind, Beginner's Mind

"In the beginner's mind there are many possibilities,

but in the expert's there are few"

(Suzuki Roshi - Zen Mind, Beginner's Mind)



Thank You SPLASH! Questions?

Email: s13428-teachers@esp.mit.edu