Mindfulness for Wellbeing and Peak Performance

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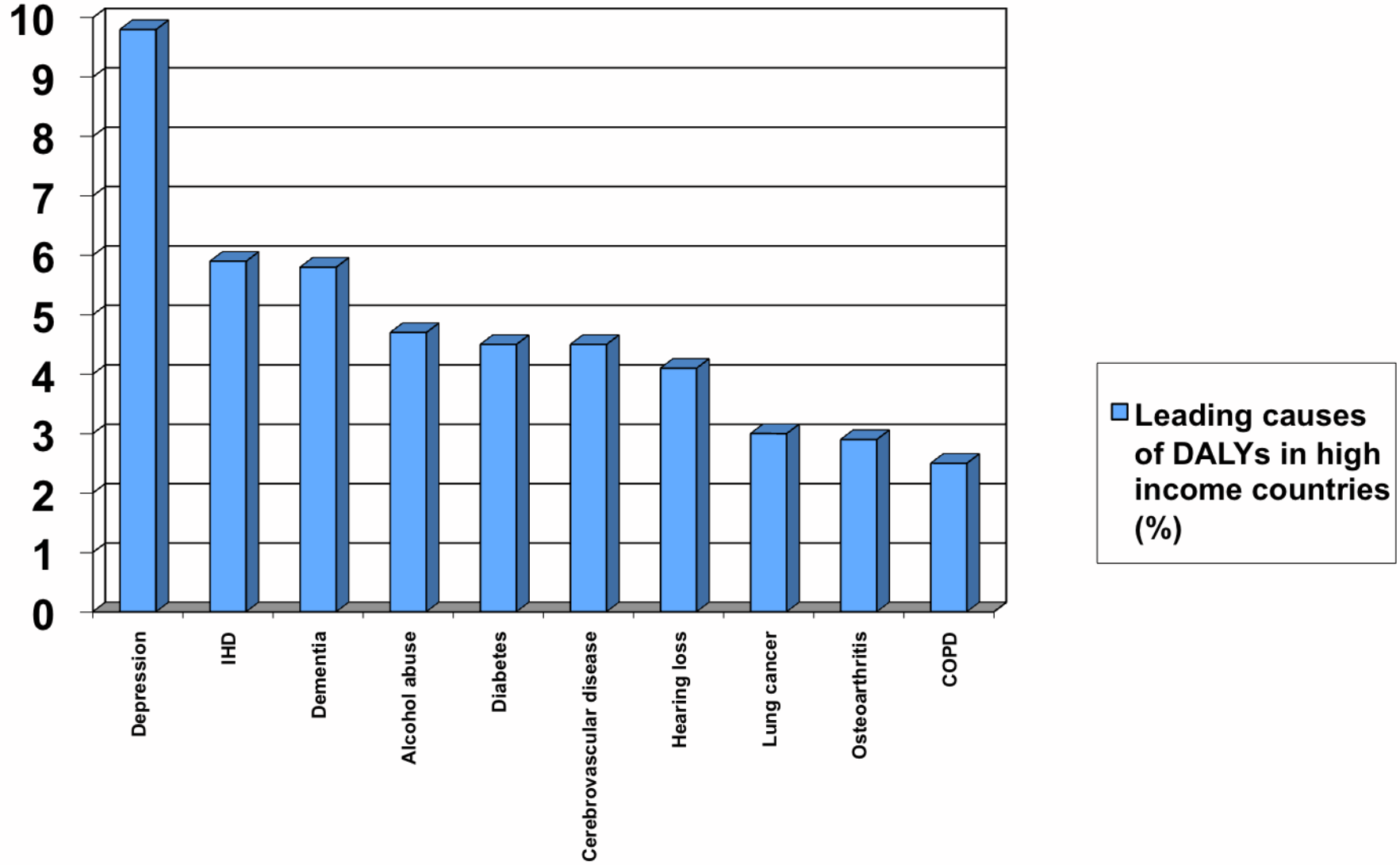
Falling attention spans

- According to a Microsoft Canada report, the average human's attention span is below that of a goldfish (8 sec vs. 9 sec)
  - http://time.com/3858309/attention-spans-goldfish/
- "…the true scarce commodity is increasingly human attention"
  - Satya Nadella – CEO Microsoft
    - https://qz.com/232884/microsofts-new-worldview-marks-a-complete-change-from-what-made-it-huge-in-the-first-place/

The ‘online brain’

- Review of psychological, psychiatric and neuroimaging research examined how Internet changes cognition and the brain
- Internet can produce acute and long-term alterations in areas of cognition and changes in the brain
  a) **attentional capacities**
  b) **memory processes**
  c) **social cognition**
     - Firth J, Torous J, Stubbs B, et al. The "online brain": how the Internet may be changing our cognition. World Psychiatry. 2019 Jun;18(2):119-129. doi: 10.1002/wps.20617.

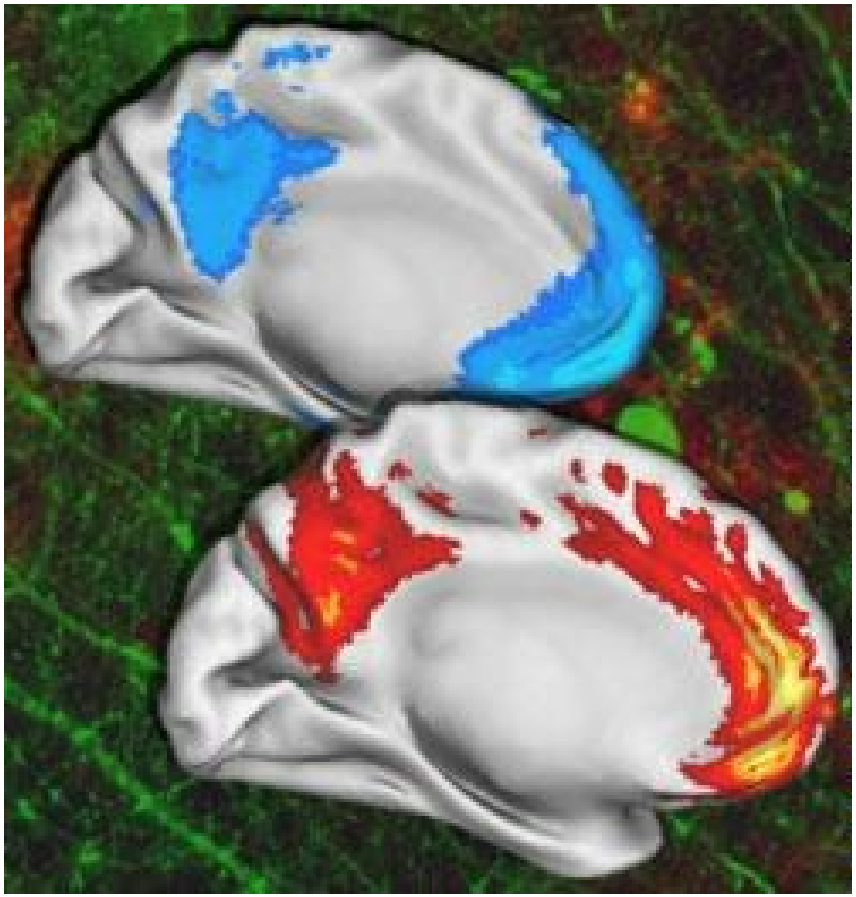


Mathers CD, Loncar D. Projections of global mortality and burden of disease from 2002 to 2030. PLoS Med. 2006 Nov;3(11):e442.

Burnout and psychiatric morbidity in new medical graduates

- 8 months into internship: 75% interns had burnout
- 73% (of interns) met criteria for psychiatric morbidity on at least one occasion
  - Willcock SM et al. Burnout and psychiatric morbidity in new medical graduates. Med J Aust. 2004;181(7):357-60.

The Default Brain



- Task Positive Network
  - Focused: on-task
    - Tasks associated with paying attention
    - Brain efficient and quiet
  - Executive function circuits activated
  - Reflecting
- Default Mode Network
  - Mind is inattentive, distracted, idle, recalling past, daydreaming
  - Automatic pilot
  - Executive functioning circuits offline
  - Ruminating

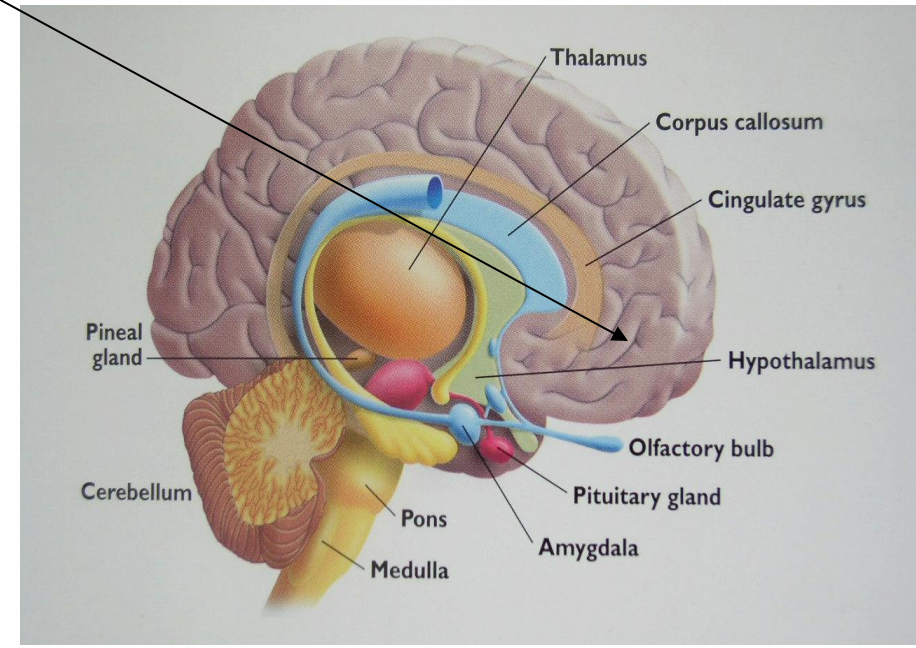
The Default Brain

Associated with

- Stress (Brewer et al., 2011)
- Anxiety (Zhao et al., 2007)
- Depression (Greicius et al., 2007)
- ADHD (Uddin et al., 2008a)
- Schizophrenia (Pomarol-Clotet et al., 2008)
- Autism (Kennedy & Courchesne, 2008)
- Alzheimer's dementia (Firbank et al., 2007)
- Criminal recidivism (Aharoni et al., 2013)
- Reduced performance (Brewer et al., 2011)

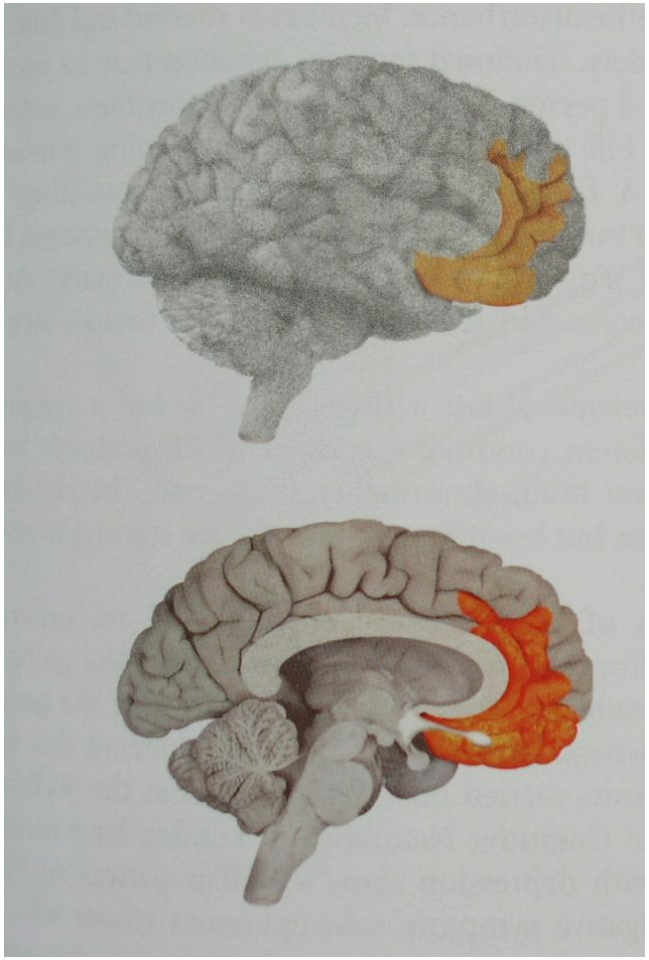
Executive functioning and attention

- Frontal lobes (prefrontal cortex) centre for executive functioning
  - Attention regulation
  - Working memory
  - Self-awareness
  - Decision making
  - Emotional regulation
  - Appetite regulation
  - Impulse control
- Limbic system – emotion centre
- Mesolimbic reward system – appetites

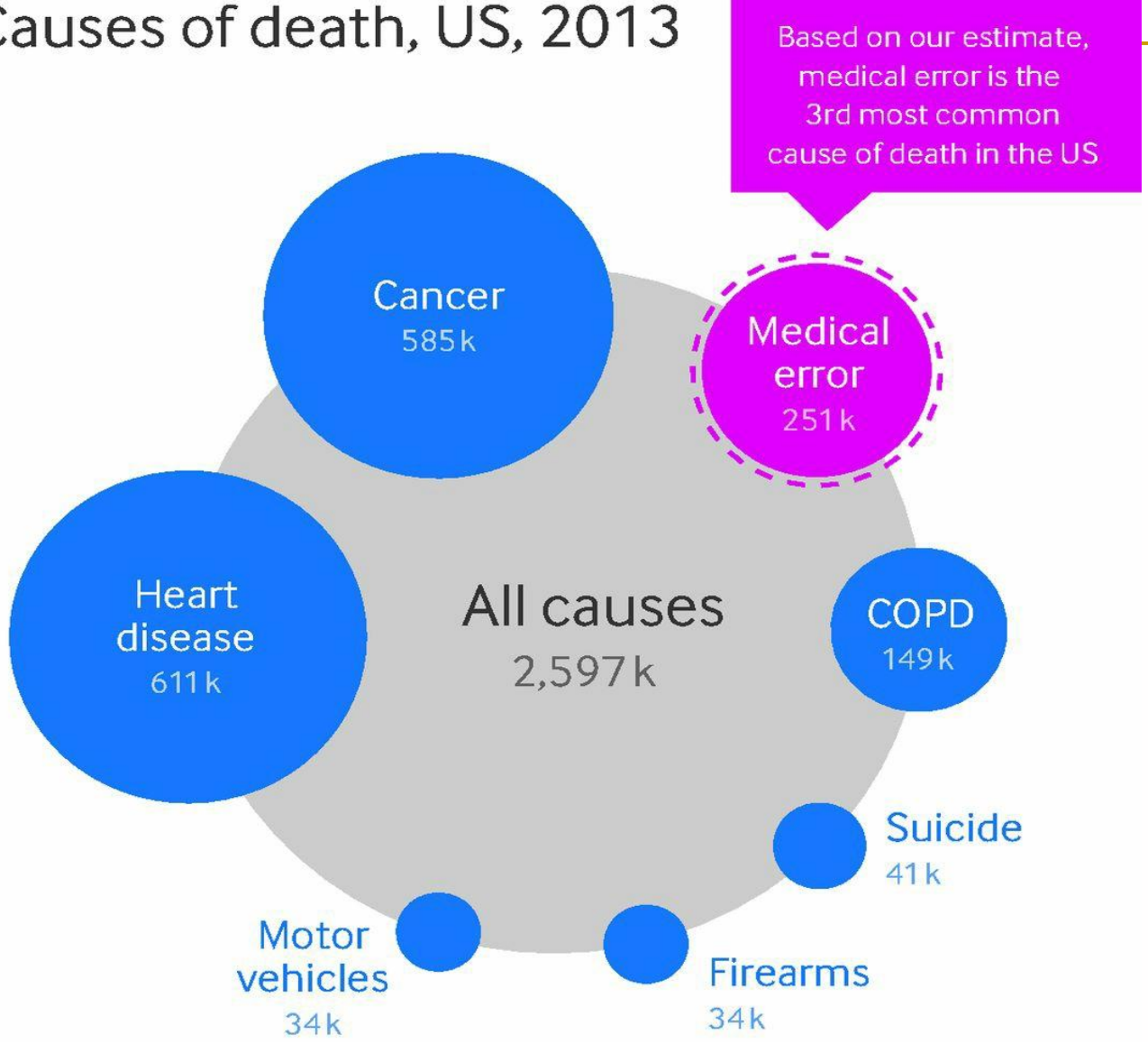


Stress and performance

- “Performance pressure harms individuals most qualified to succeed by consuming the working memory capacity that they rely on for their superior performance.”
  - Beilock SL, Carr TH. Psychol Sci. 2005;16(2):101-5.



Causes of death, US, 2013



However, we're not even counting this - medical error is not recorded on US death certificates

Data source:
http://www.cdc.gov/nchs/data/nvsr/nvsr64/nvsr64_02.pdf

Doctor health and medical errors

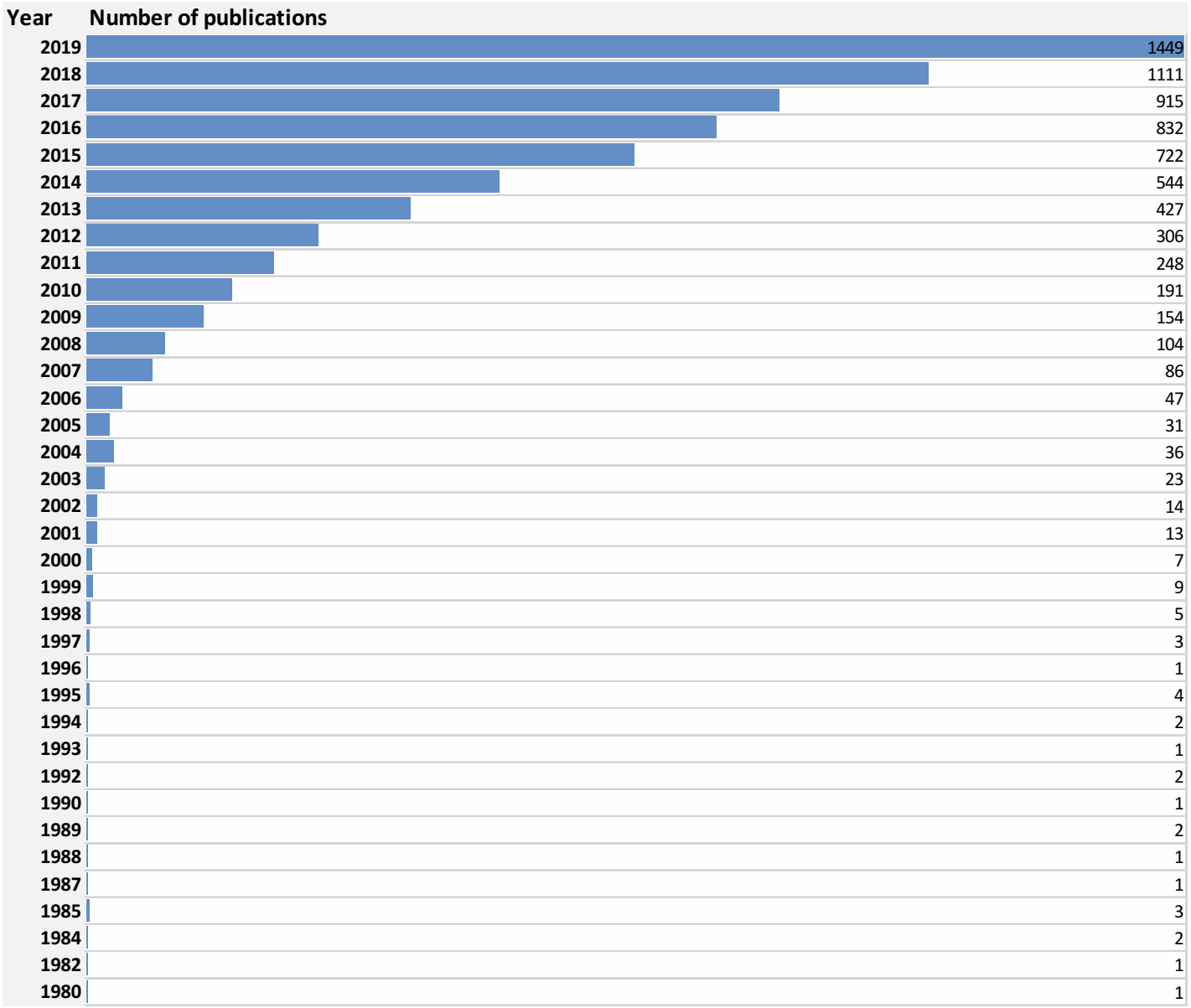
- Study determined prevalence of depression and burnout among residents medical staff in 3 US hospitals
- 20% of residents met criteria for depression
- 74% met the criteria for burnout
- Depressed residents made 6.2 times as many medication errors as residents who were not depressed
  - Fahrenkopf AM, Sectish TC, Barger LK, et al. Rates of medication errors among depressed and burnt out residents: prospective cohort study. BMJ, doi:10.1136/bmj.39469.763218.BE (published 7 February 2008)

Attention Deficit Trait

- Newly recognized neurological phenomenon: attention deficit trait (ADT)
  - Response to hyperkinetic environment
- Trying to deal with too much input, results in:
  - Black-and-white thinking; perspective and shades of grey disappear
  - Difficulty staying organized, setting priorities, and managing time
  - Feel a constant low level of panic and guilt
    - Hallowell EM. Overloaded circuits: why smart people underperform. Harv Bus Rev. 2005 Jan;83(1):54-62, 116.

- “The faculty of voluntarily bringing back a wandering attention over and over again, is the very root of judgment, character, and will. No one is compos sui if he have it not. An education which should improve this faculty would be the education par excellence. But it is easier to define this ideal than to give practical instructions for bringing it about.”
  - William James, Principles of Psychology, 1890

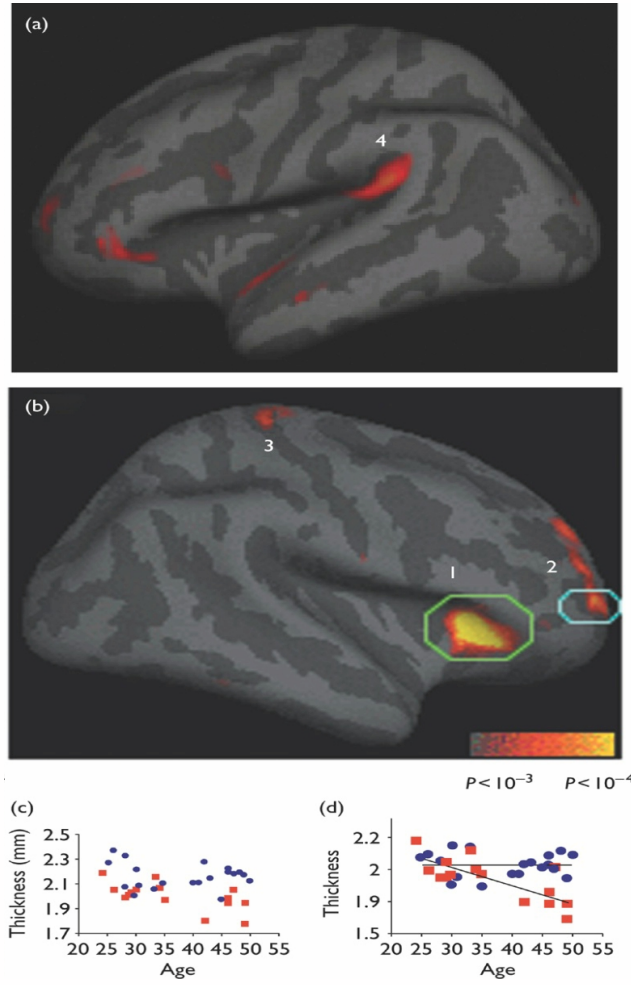
Number of mindfulness journal publications listed on PubMed by year: 1980-2019



Year	Number of publications
2019	1449
2018	1111
2017	915
2016	832
2015	722
2014	544
2013	427
2012	306
2011	248
2010	191
2009	154
2008	104
2007	86
2006	47
2005	31
2004	36
2003	23
2002	14
2001	13
2000	7
1999	9
1998	5
1997	3
1996	1
1995	4
1994	2
1993	1
1992	2
1990	1
1989	2
1988	1
1987	1
1985	3
1984	2
1982	1
1980	1

Mindfulness and the brain

- Mindfulness training improves functioning in areas related to executive functioning, attentional control, self-regulation, sensory processing, memory and regulation of the stress response
  - Thickening of cortex in regions associated with attention, self-awareness and sensory processing thicker in meditators
  - "The regular practice of meditation may have neuroprotective effects and reduce the cognitive decline associated with normal aging."
    - Hölzel BK, Carmody J, Evans KC, et al. Stress reduction correlates with structural changes in the amygdala. Soc Cogn Affect Neurosci. 2010 Mar;5(1):11-7.
    - Hölzel BK, Carmody J, Vangel M, et al. Mindfulness practice leads to increases in regional brain gray matter density. Psychiatry Res. 2011 Jan 30;191(1):36-43.
    - Kilpatrick LA, Suyenobu BY, Smith SR, et al. Impact of Mindfulness-Based Stress Reduction training on intrinsic brain connectivity. Neuroimage. 2011 May 1;56(1):290-8.
    - Lazar SW, Kerr CE, Wasserman RH, et al. Neuroreport. 2005;16(17):1893-1897.
    - Pagnoni G. Cekic M. Neurobiology of Aging. 2007;28(10):1623-7.



Practicing mindfulness

- Formal practice
  - Mindfulness meditation (focused attention)
- Informal practice
  - Mindful while engaged in daily activities and work

Mindfulness and attention regulation

- Mindfulness involves **attention** and **attitude**
- Attention regulation has three aspects

1. To know where our attention is
2. To prioritise where the attention needs to be
3. For the attention to go there and stay there

- Mindful attitude e.g.
    1. Openness
    2. Curiosity
    3. Acceptance
    4. Self-compassion
    5. Equanimity

The distraction of notifications

- Undergraduate university students performed a simple task
- On the second run through, they were split into three groups
  1. Called on the phone
  2. Received a text
  3. Not interrupted
- Participants didn't know they were being contacted as part of the study
- Phone calls caused 28% increase in mistakes even though had their phones set to vibrate and didn't take them out or look at them during the study
  - Stothart C, Mitchum A, Yehnert C. The Attentional Cost of Receiving a Cell Phone Notification.. Journal of Experimental Psychology: Human Perception and Performance, 2015; DOI: 10.1037/xhp0000100

Smartphones and cognitive performance

- Series of experiments: 520 college students performed tasks requiring focus, attention, and problem-solving skills
- Some were asked to leave their smartphones in another room, others to keep them in their pocket or purse, and others to put their phones on the desk next to them
- Performance on tasks of attention and problem-solving varied depending on the location of the smartphone:
  - Scores highest when the smartphone in the next room
  - Scores lowest when the phone on the desk
  - Impact of smartphone's location most dramatic among those most reliant on their phones
  - The effect not altered by having the phone powered off (vs. set to silent mode) or placed face down (vs. face up)
- It may be that the power, convenience, and connectivity provided by smartphones come at a cognitive cost – "brain drain"
  - Ward AF, Duke K, Gneezy A, Bos MW. Brain Drain: The Mere Presence of One's Own Smartphone Reduces Available Cognitive Capacity. JACR 2017;2(2):140-154. Published online April 3. http://dx.doi.org/10.1086/691462

Smartphones and cognitive performance

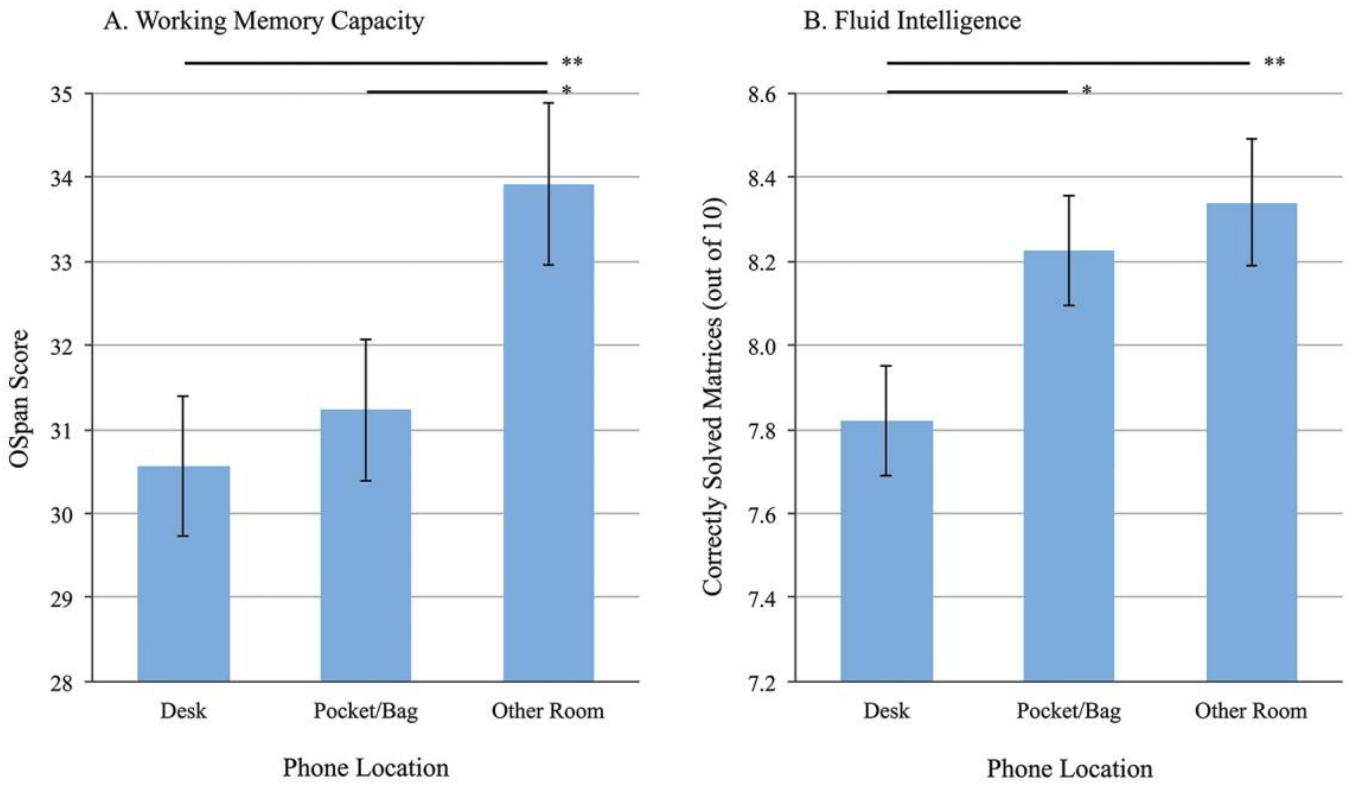
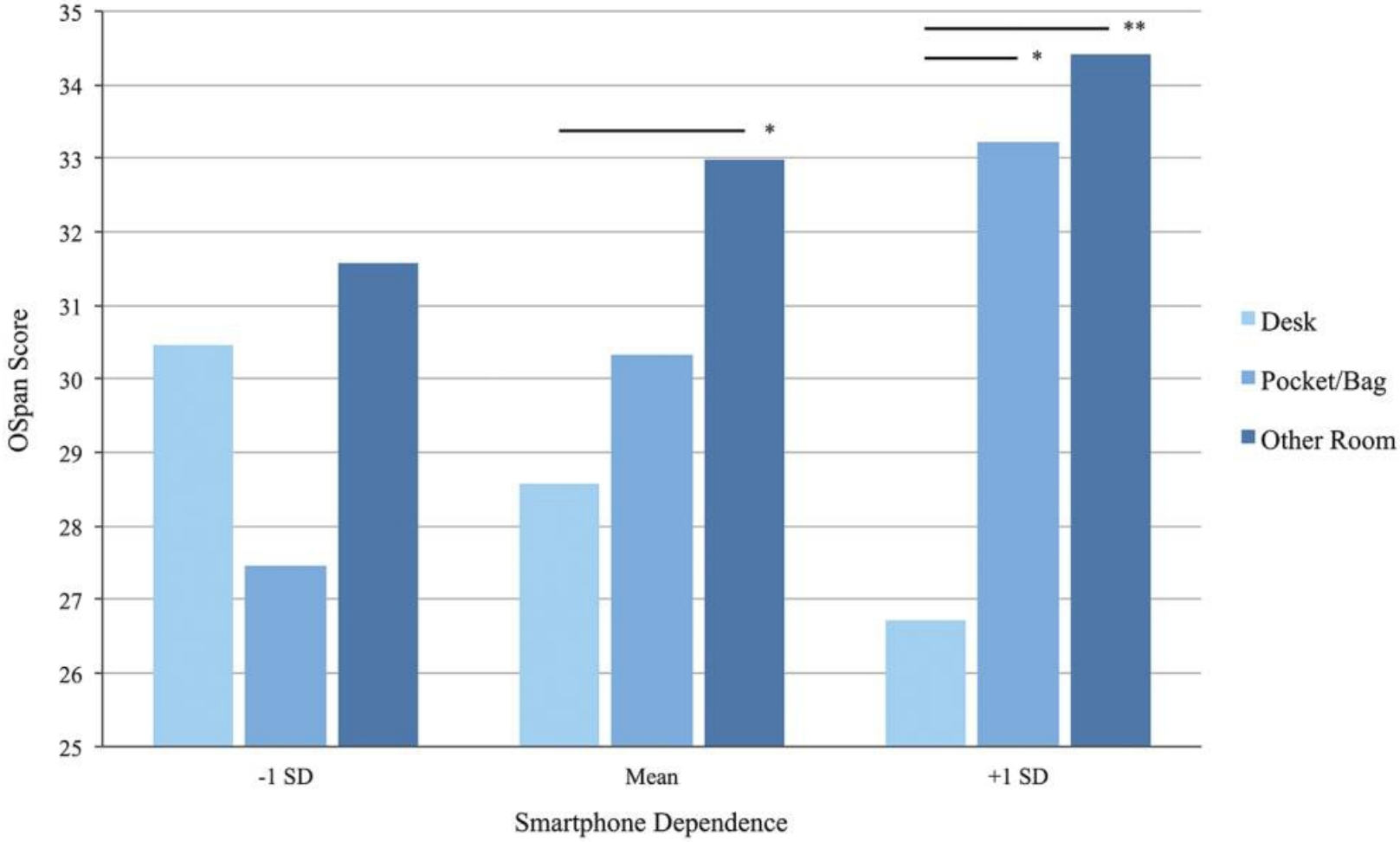


Figure 1. Experiment 1: effect of randomly assigned phone location condition on available WMC (OSpan Score, panel *A*) and functional Gf (Correctly Solved Raven's Matrices, panel *B*). Participants in the "desk" condition (high salience) displayed the lowest available cognitive capacity; those in the "other room" condition (low salience) displayed the highest available cognitive capacity. Error bars represent standard errors of the means. Asterisks indicate significant differences between conditions, with $^{*}p < .05$ and $^{**}p < .01$.

Smartphones and cognitive performance



Interrupting the flow

- Average of **64 seconds** to **recover train of thought** after checking **email**
- Check **every 5 mins** = waste **8.5 hours per week**
  - Jackson, Dawson & Wilson (2002)

Mobile phone use and motor vehicle accidents

- Driver's use of a mobile phone within 5 min before a crash associated with fourfold increased likelihood of crashing (OR 4.1)
  - McEvoy SP, Stevenson MR, Woodward M.The contribution of passengers versus mobile phone use to motor vehicle crashes resulting in hospital attendance by the driver. Accid Anal Prev. 2007 Nov;39(6):1170-6. Epub 2007 Apr 9.
- Texting / emailing / internet while driving increased the risk 164-fold
  - Hickman JS, Hanowski RJ. An assessment of commercial motor vehicle driver distraction using naturalistic driving data. Traffic Inj Prev. 2012;13(6):612-9. doi: 10.1080/15389588.2012.683841.

Medical students and multitasking

- Study measured effect of multitasking on mental workload / performance of medical students
- Medical students completed 4 standardised tasks for 4 minutes each:
  1. Inactivity
  2. Listening
  3. Venepuncture
  4. A combination of listening and venipuncture
- Combining the 2 tasks showed poorer performance at venepuncture and listening deteriorated
  - Woods B, Byrne A, Bodger O. The effect of multitasking on the communication skill and clinical skills of medical students. BMC Med Educ 2018;18:76. https://doi.org/10.1186/s12909-018-1183-5

The Illusion Of Multitasking

- **Attention switching**
  - So fast it *appears* we are doing multiple things simultaneously
- **Attentional blink**
  - **Lag time** of 200 to 500 milliseconds (0.5 second)
  - Increased by **stress**
    - Slatger, Lutz, Greishchar et al. (2007)

Gender and multitasking

- According to a popular stereotype, women are better at multitasking than men
- Study tested gender differences in sequential (i.e. task switching) and concurrent (i.e. dual tasking) multitasking
  - Controlled for possible gender differences in working memory, processing speed, spatial abilities, fluid intelligence
  - Tested multitasking abilities across five different indices (i.e. performance costs) for reaction time (RT) and accuracy measures
- Multitasking resulted in substantial performance costs across all experimental conditions without a single significant gender difference in any of these ten measures, even when controlling for gender differences in underlying cognitive abilities
- **"… results do not confirm the widespread stereotype that women are better at multitasking than men…"**
  - Hirsch P, Koch I, Karbach J (2019) Putting a stereotype to the test: The case of gender differences in multitasking costs in task-switching and dual-task situations. PLoS ONE 14(8): e0220150. https://doi.org/10.1371/journal.pone.0220150

Emotional Intelligence & mindfulness

- Mindfulness related to aspects of personality and mental health
  - Lower neuroticism, psychological symptoms, experiential avoidance, dissociation
  - Higher emotional intelligence and absorption
    - Baer RA, et al. Assessment. 2004;11(3):191-206.

EI	Definition
Self-awareness	Ability to recognise and understand emotions, drives and effects
Self-regulation	Can control or redirect disruptive impulses, can think before acting
Motivation	Passion for work that goes beyond money or status, energy and persistence
Empathy	Ability to understand emotions of others, skill in interacting with others
Social skill	Can manage relationships and build networks, can find common ground, rapport

Mindfulness and communication

- Comparing clinicians with highest and lowest mindfulness scores: high-mindfulness clinician consultations:
  - Patient-centered pattern of communication (OR 4.14)
  - Both patients and clinicians engaged in more rapport building and discussion of psychosocial issues
  - Displayed more positive emotional tone with patients
  - Patients more likely to give high ratings on clinician communication and to report high overall satisfaction
    - Beach MC, Roter D, Korthuis PT, Epstein RM, et al. A Multicenter Study of Physician Mindfulness and Health Care Quality doi: 10.1370/afm.1507 Ann Fam Med 2013;11(5):421-428.

Mindfulness and compassion for healthcarers

- Systematic review of 58 studies on mindfulness and compassion characteristics of HCPs
- MBSR effective at improving mindfulness and self-compassion, burnout, depression, anxiety, stress
- Compassion-related interventions improve self-compassion, mindfulness and interpersonal conflict
- Mindfulness effective at improving negative affect and compassion fatigue
  - Conversano C, Ciacchini R, Orrù G, et al. Mindfulness, Compassion, and Self-Compassion Among Health Care Professionals: What's New? A Systematic Review. Front Psychol. 2020 Jul 31;11:1683. doi: 10.3389/fpsyg.2020.01683. PMID: 32849021; PMCID: PMC7412718.

Mindfulness and prosocial behaviour

- Meta-analysis reviewed link between mindfulness – as both a personality variable and an intervention – and prosocial behavior
  - 31 eligible studies (N = 17,241)
- Found positive effect b/w mindfulness and prosocial behaviour for both correlational and intervention studies
- For the latter, medium-sized effects obtained across varying meditation types and intensities, and across gender and age categories
  - Donald JN, Sahdra BK, Van Zanden B, et al. Does your mindfulness benefit others? A systematic review and meta-analysis of the link between mindfulness and prosocial behavior. British Journal of Psychology (2018) DOI:10.1111/bjop.12338

Mindfulness for health-care professionals and students

- Meta-analysis of 38 studies quantified effectiveness of MBIs on distress, well-being, physical health, and performance in HCPs and HCPs-in-training
- MBIs had a significant moderate effect on anxiety, depression, psychological distress, and stress
- Small to moderate effects for burnout and well-being at post-intervention
- Larger intervention effects on overall outcomes found with HCPs, with MBSR intervention
  - Spinelli C, Wisener M, Khoury B. Mindfulness training for healthcare professionals and trainees: A meta-analysis of randomized controlled trials. Journal or Psychosomatic Research 2019;120:29-38. doi: 10.1016/j.psychores.2019.03.003

Mindfulness and practitioner wellbeing

- An 8-week mindfulness program: improvements on all measures of wellbeing including:
  - Mindfulness
  - Burnout (emotional exhaustion; depersonalization; personal accomplishment)
  - Empathy and responsiveness to psychosocial aspects
  - Total mood disturbance
  - Personality (conscientiousness; emotional stability)
- Improvements in mindfulness correlated with improvements on other scales
  - Krasner MS, Epstein RM, Beckman H, et al. JAMA. 2009;302(12):1338-40.

Mindful practice

- Mindfulness is essential underpinning for self-monitoring
- “Mindful practice is conscious and intentional attentiveness to the present situation – the raw sensations, thoughts, and emotions as well as the interpretations, judgments and heuristics that one applies to a particular situation.”
- Avoids automatic pilot
  - Epstein RM. Mindful practice. JAMA. 1999 Sep 1;282(9):833-9. doi: 10.1001/jama.282.9.833. PMID: 10478689.
  - Epstein R, Siegel D, Silberman J. Self-monitoring in clinical practice: a challenge for medical educators. J Cont Educ Health Prof 2008;28(1):5-13.
  - Epstein RM. Mindful practice in action (II): Cultivating habits of mind. Fam Syst Health . 2003;21: 11-17.

Mindfulness and surgeon performance

- Study explored benefits to stress, cognition, and performance in PGY-1 surgery residents randomised to modified MBSR vs control group
- Evaluated baseline (T1), post-intervention (T2), 1 yr (T3)
- Weekly 2-hour modMBSR classes and 20 minutes daily home practice during an 8-week period vs active control
- Differences at T2 and T3 favour modMBSR in stress, mindfulness, burnout, working memory, cognitive control and surgical skills (e.g. circle-cutting time)
- fMRI: post-intervention activity in modMBSR arm in executive function control and self-awareness
  - Lebares CC, Guvva EV, Olaru M, et al. Efficacy of Mindfulness-Based Cognitive Training in Surgery: Additional Analysis of the Mindful Surgeon Pilot Randomized Clinical Trial. JAMA Netw Open. 2019 May 3;2(5):e194108. doi: 10.1001/jamanetworkopen.2019.4108.

Bias: the root of decision errors

- Unconscious bias often leads to the misreading of a situation and decision errors e.g.
- Confirmation bias: the pursuit of data that support a diagnosis over data that refute it
- Anchoring bias: a resistance to adapting appropriately to subsequent data that suggest alternative diagnoses
  - Sibinga EM, Wu AW. Clinician Mindfulness and Patient Safety. JAMA 2010;304(22):2532-3.

Mindfulness and motivation

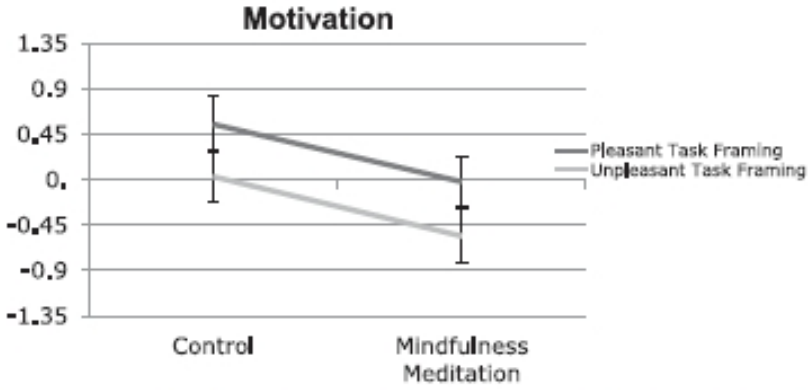


Fig. 1. Task motivation as a function of mindfulness condition and task valence framing condition in Experiment 2. Error bars indicate standard errors.

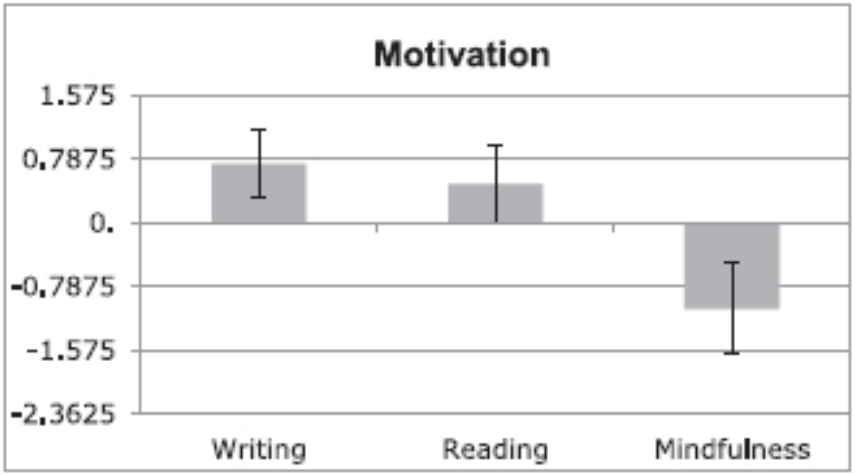


Fig. 2. Task motivation as a function of mindfulness, writing, or reading condition in Experiment 3. Error bars indicate standard errors.

From Hafenbrack AC, Vohs KD. From Mindfulness Meditation Impairs Task Motivation but Not Performance. Organizational Behavior and Human Decision Processes 2018;147:1-15. https://doi.org/10.1016/j.obhdp.2018.05.001

Mindfulness and motivation

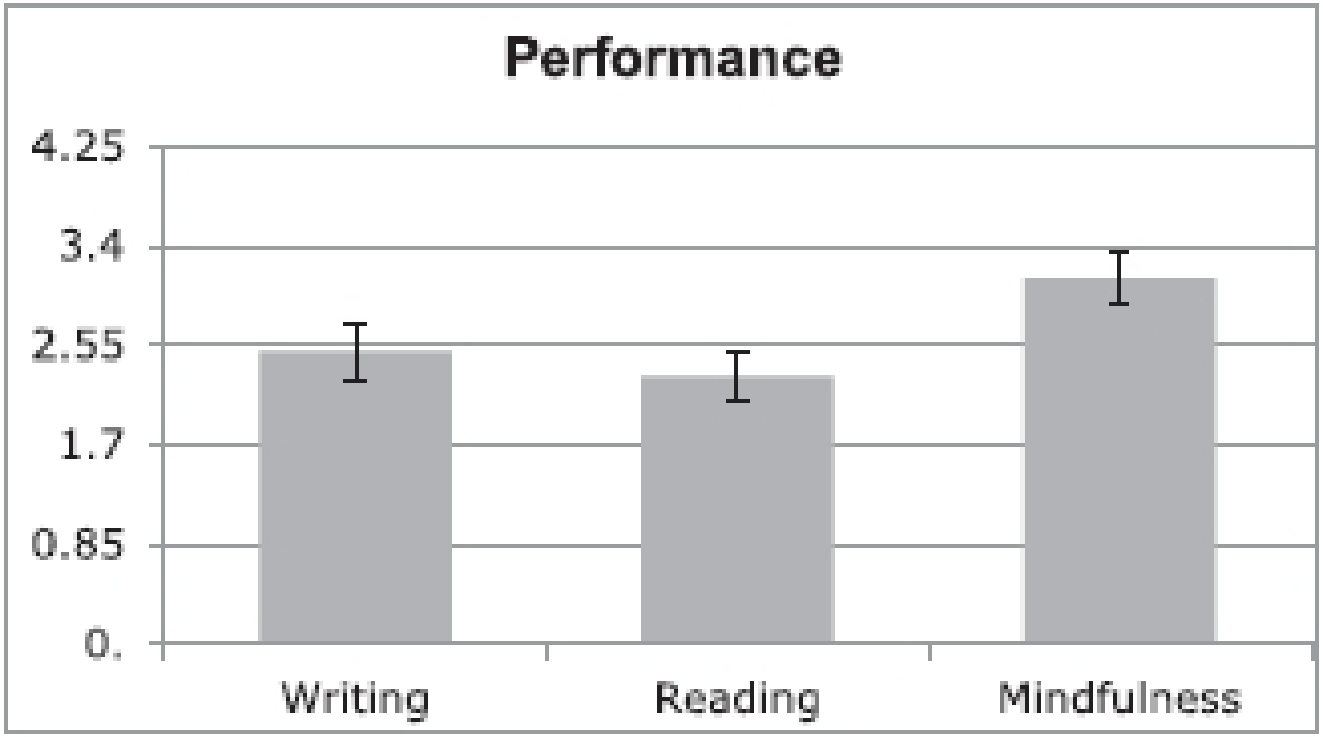


Fig. 3. Task performance as a function of mindfulness, writing, or reading condition in Experiment 3. Error bars indicate standard errors.

From Hafenbrack AC, Vohs KD. From Mindfulness Meditation Impairs Task Motivation but Not Performance. Organizational Behavior and Human Decision Processes 2018;147:1-15. https://doi.org/10.1016/j.obhdp.2018.05.001

Motivation

- Motivation generally measured in terms of:

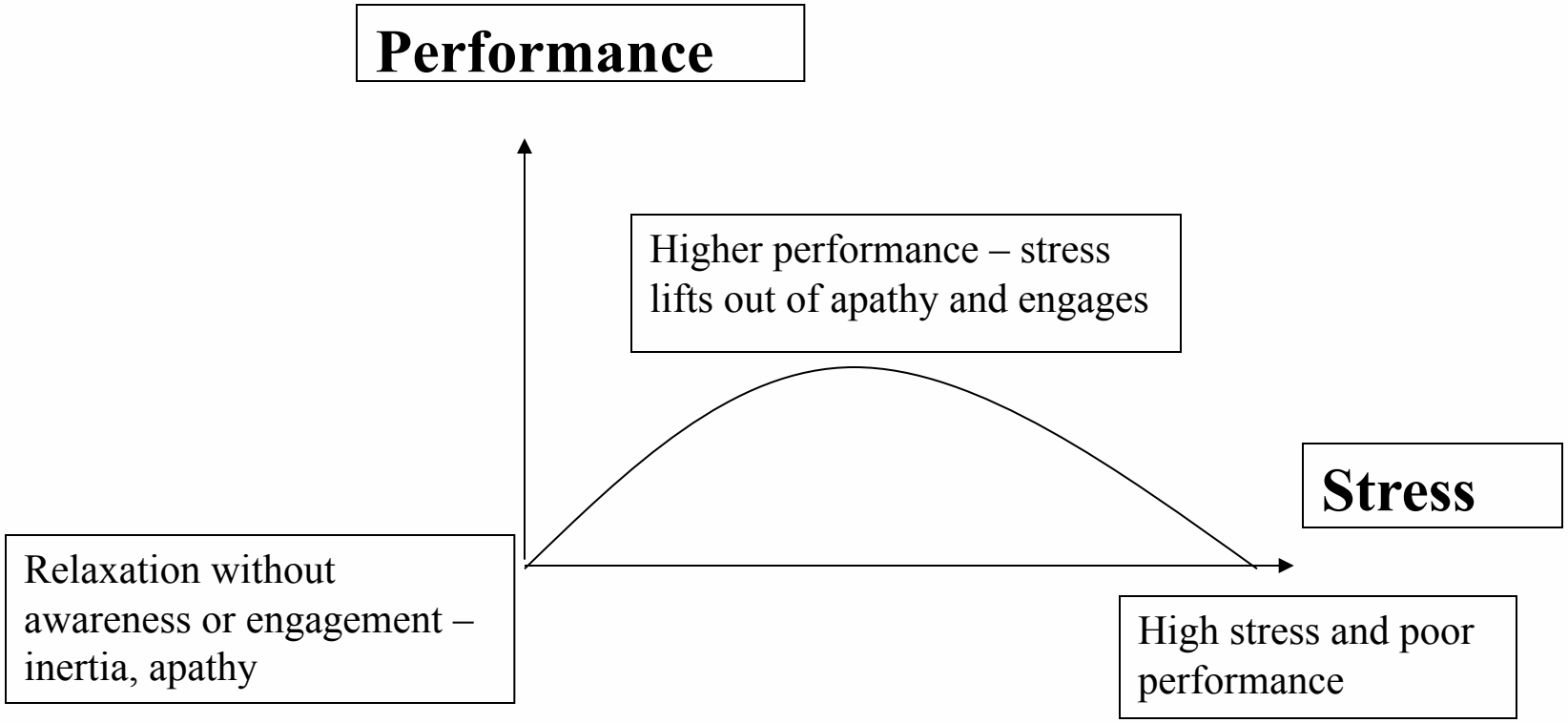
1. Arousal (i.e. stress)
2. Future focus (i.e. worried about the outcome)

- Mindfulness helps people to be:

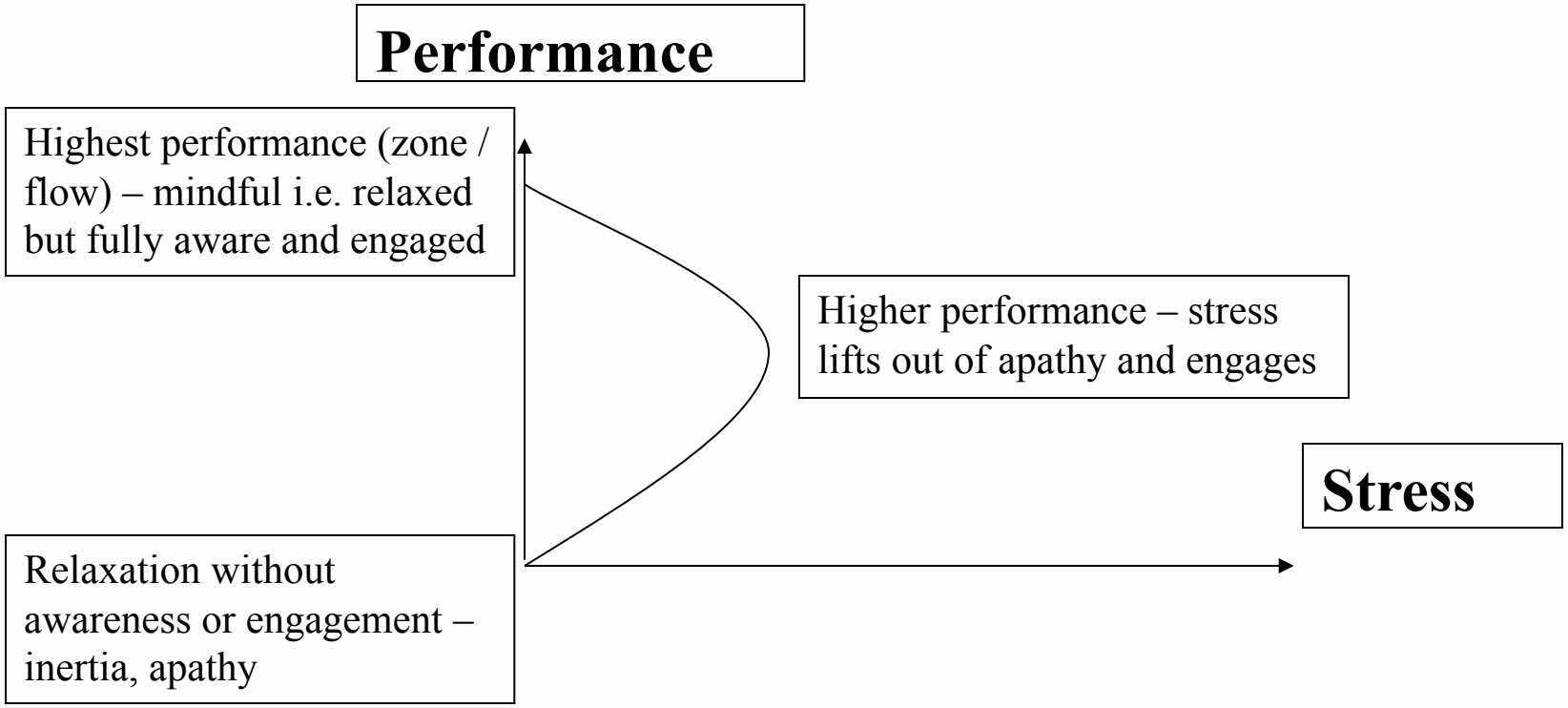
1. Calmer (not apathetic)
2. Present focus (focused on task / process)

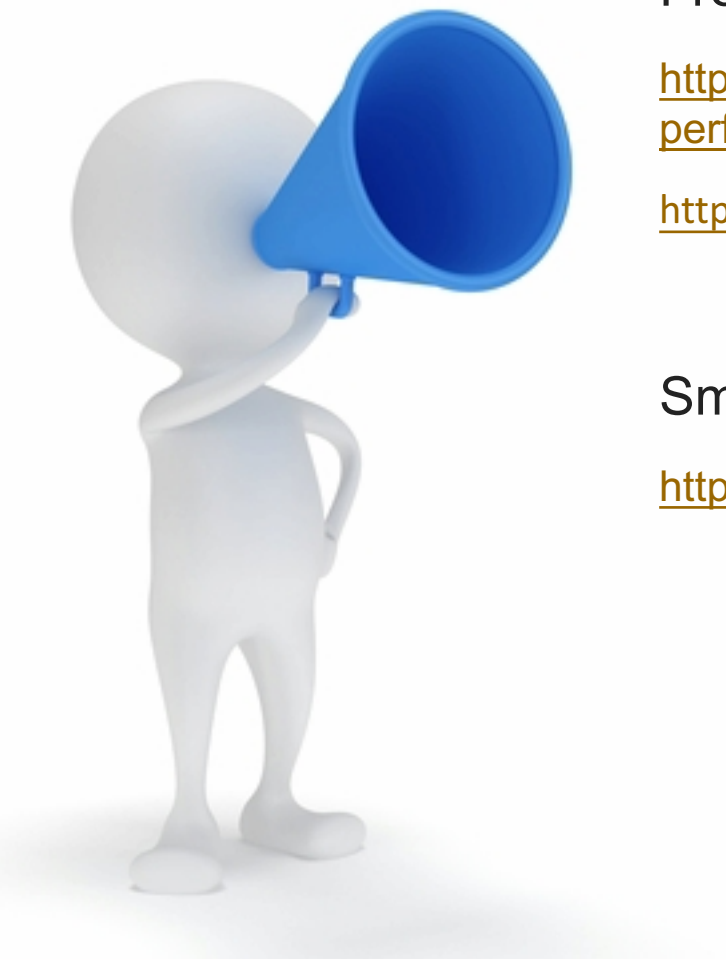
- That is why so many high-performing individuals / teams use mindfulness

Yerkes-Dodson Stress-performance curve



Mindfulness stress-performance curve





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