The Science and Practice of Mindfulness

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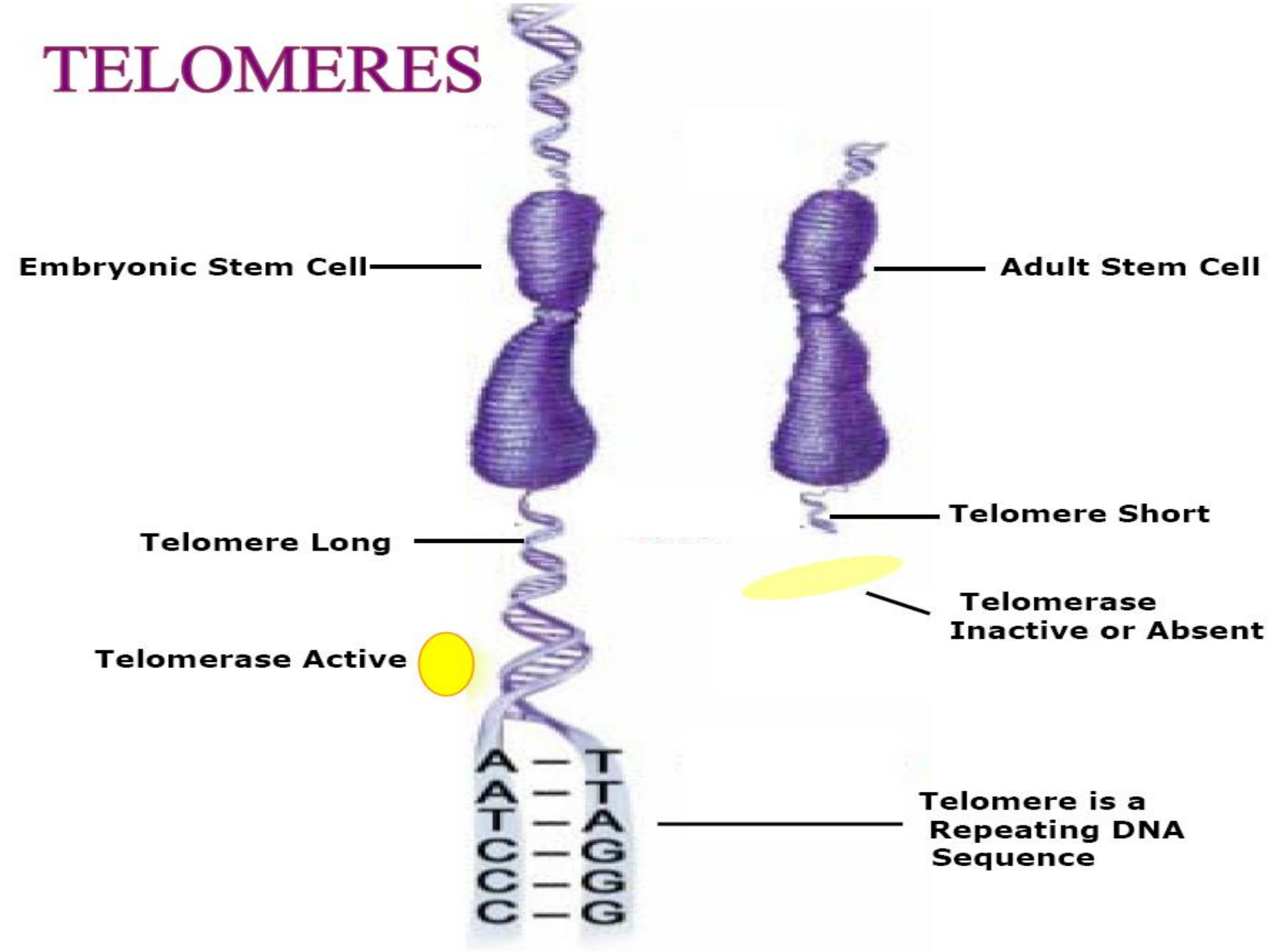
Today's session

- Brief introduction
- Mindfulness experiments
  1. Mindfulness meditation - the formal practice
  2. Dealing with distractor influence
  3. Multitasking vs. efficient attention switching
  4. Mindful communication
- A few other topics (stress-performance, interrupting flow, bias…)

Allostatic load

- Prolonged stress leads to wear-and-tear on the body (allostatic load)
  - Mediated through the Sympathetic Nervous System
- Allostatic load leads to:
  - Impaired immunity, atherosclerosis, metabolic syndrome, bone demineralization
  - Atrophy of nerve cells in the brain
    - **Hippocampal formation:** learning and memory
    - **Prefrontal cortex:** working memory, executive function
  - Growth of **Amygdala** mediates fear response
- Many of these processes are seen in chronic depression and anxiety
    - McEwen BS. Ann N Y Acad Sci. 2004;1032:1-7.

TELOMERES


Embryonic Stem Cell
Adult Stem Cell
Telomere Short
Telomere Long
Telomerase Inactive or Absent
Telomerase Active
A A T C C C
T T A G G G
Telomere is a Repeating DNA Sequence

Stress and telomere shortening

- Study on healthy premenopausal women showed that psychological stress associated with:
  - higher oxidative stress
  - lower telomerase activity (telomerase repairs DNA telomeres) leading to shorter telomere length
- These are known determinants of cell death/longevity
- Women with highest levels of perceived stress c/w low stress women have shorter telomeres
  - Average equivalent at least 9-17 years of additional ageing
- Implications for how, at the cellular level, stress may promote earlier onset of age-related diseases
  - Epel ES et al. Proc Natl Acad Sci U S A. 2004;101(49):17312-5.

Mind wandering and ageing

- The greater the level of mind wandering, the greater the level of telomere shortening (a marker of biological age)

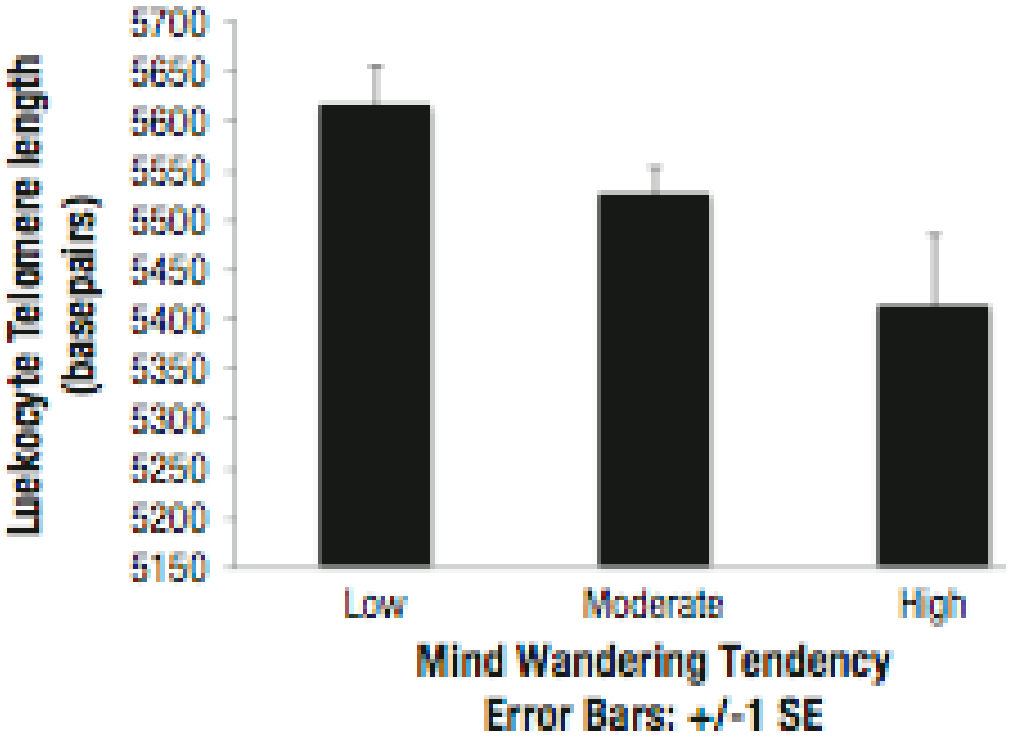
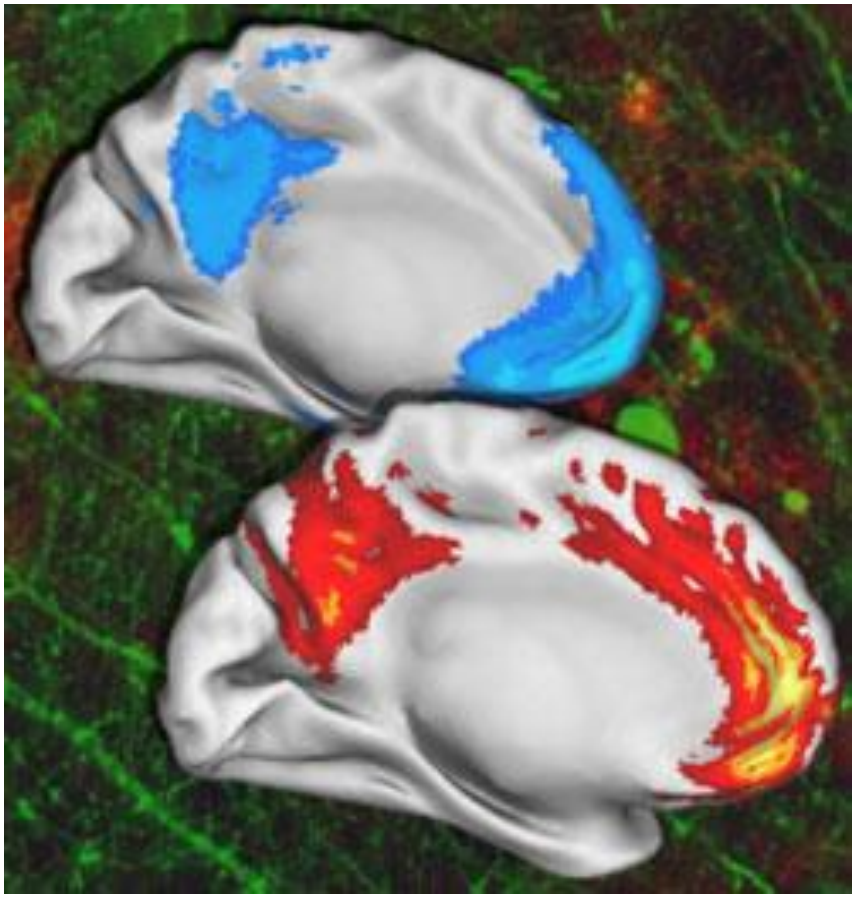


Fig. 1. Leukocyte telomere length by greater mind-wandering group.

Epel ES, Puterman E, Lin J, Blackburn E, et al. Wandering Minds and Aging Cells. Clinical Psychological Science 2012, in press.

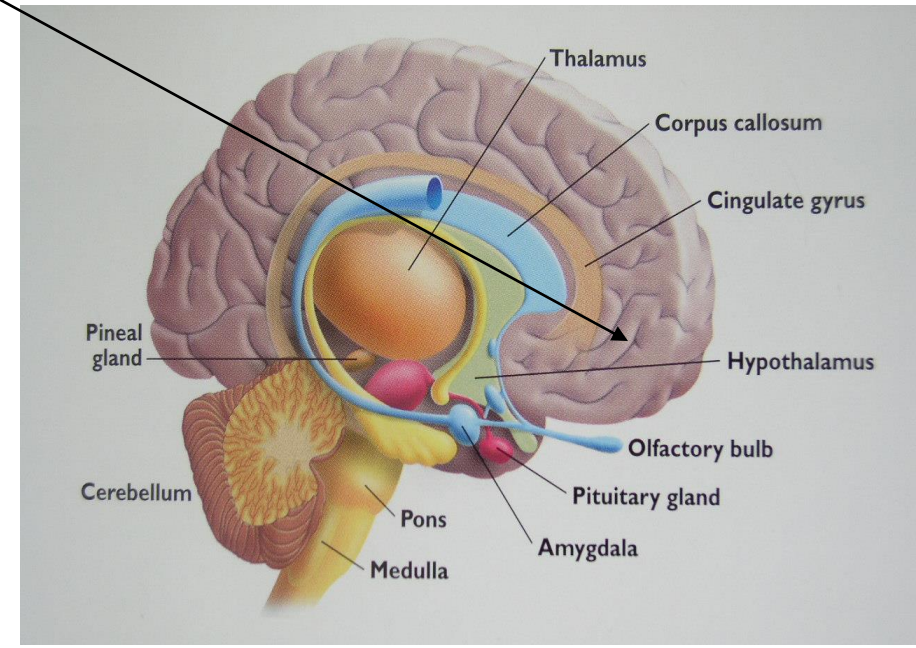
The Default Brain



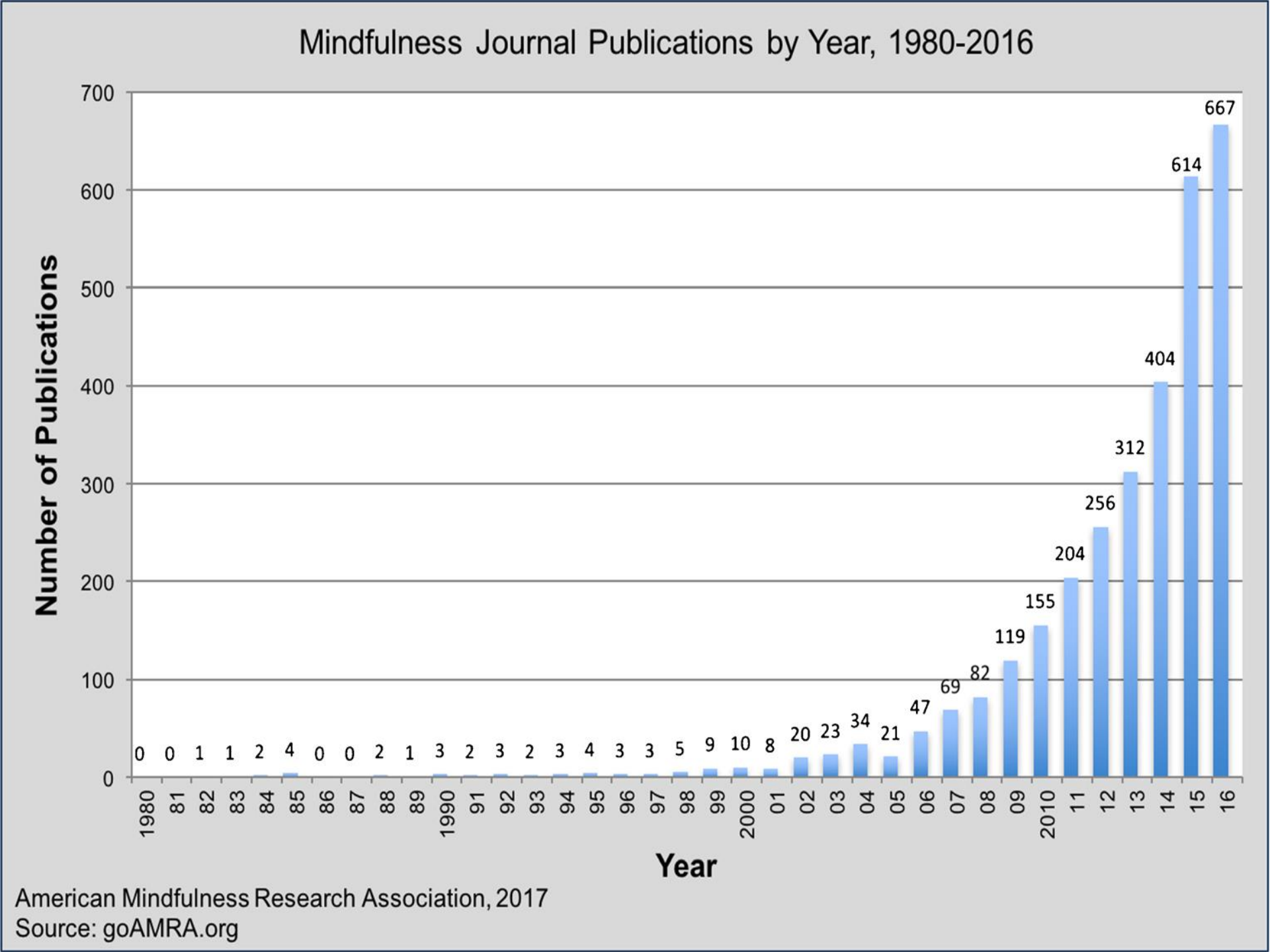
- Focused: on-task
  - Tasks associated with paying attention
  - Brain efficient and quiet
- Default state (mode)
  - Mind is inattentive, distracted, idle, recalling past, daydreaming
  - Operating on automatic pilot

Three regions of the brain

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

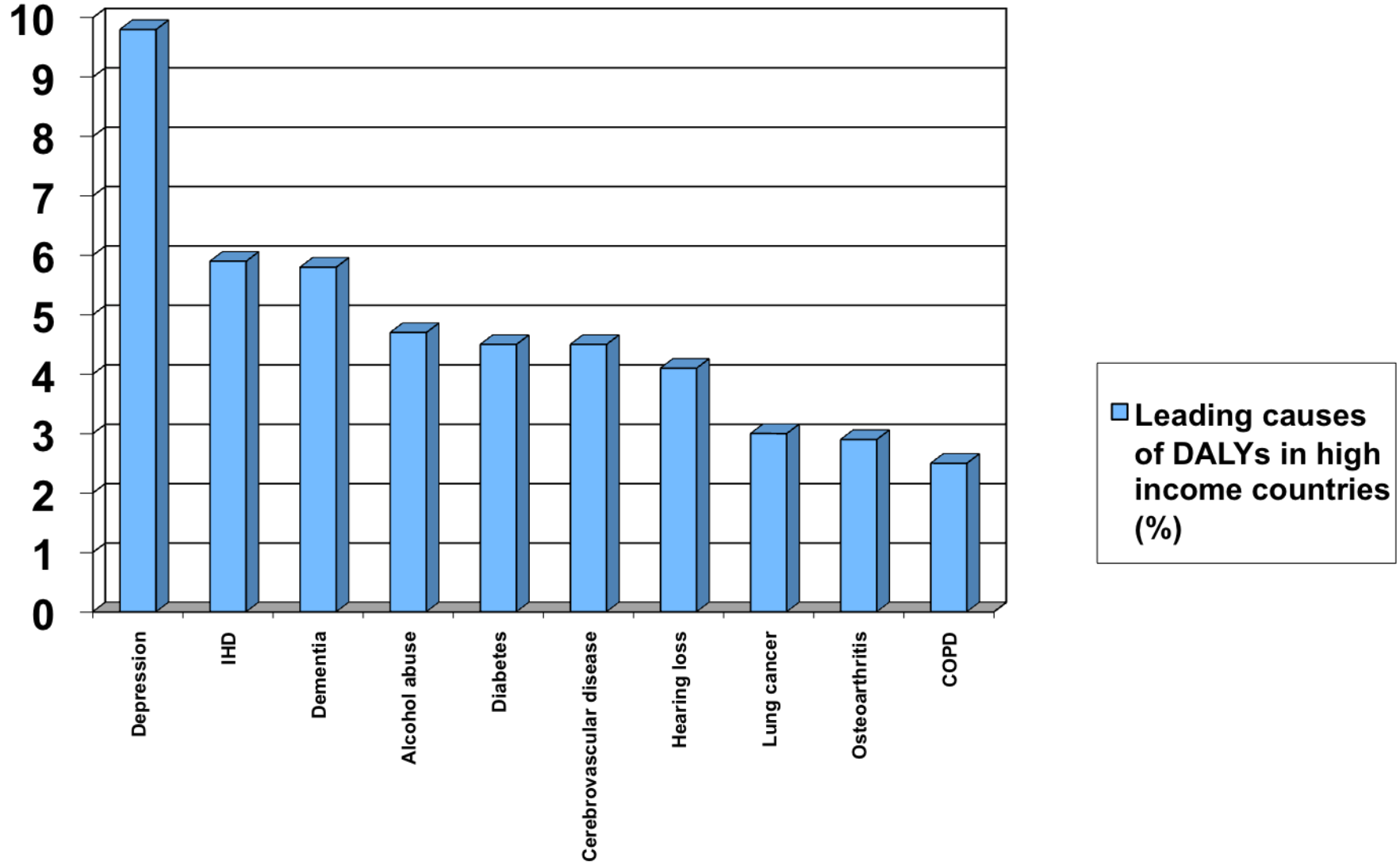


- “The faculty of voluntarily bringing back a wandering attention over and over again, is the very root of judgment, character, and will. No one is compos sui if he have it not. An education which should improve this faculty would be the education par excellence.”
  - William James, Principles of Psychology,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


Mindfulness Journal Publications by Year, 1980-2016
Number of Publications
700
600
500
400
300
200
100
0
0 0 1 1 2 4 0 0 2 1 3 2 3 2 3 4 3 3 5 9 10 8 20 23 34 21 47 69 82 119 155 204 256 312 404 614 667
1980 81 82 83 84 85 86 87 88 89 1990 91 92 93 94 95 96 97 98 99 2000 01 02 03 04 05 06 07 08 09 2010 11 12 13 14 15 16
Year
American Mindfulness Research Association, 2017
Source: goAMRA.org

Applications of mindfulness

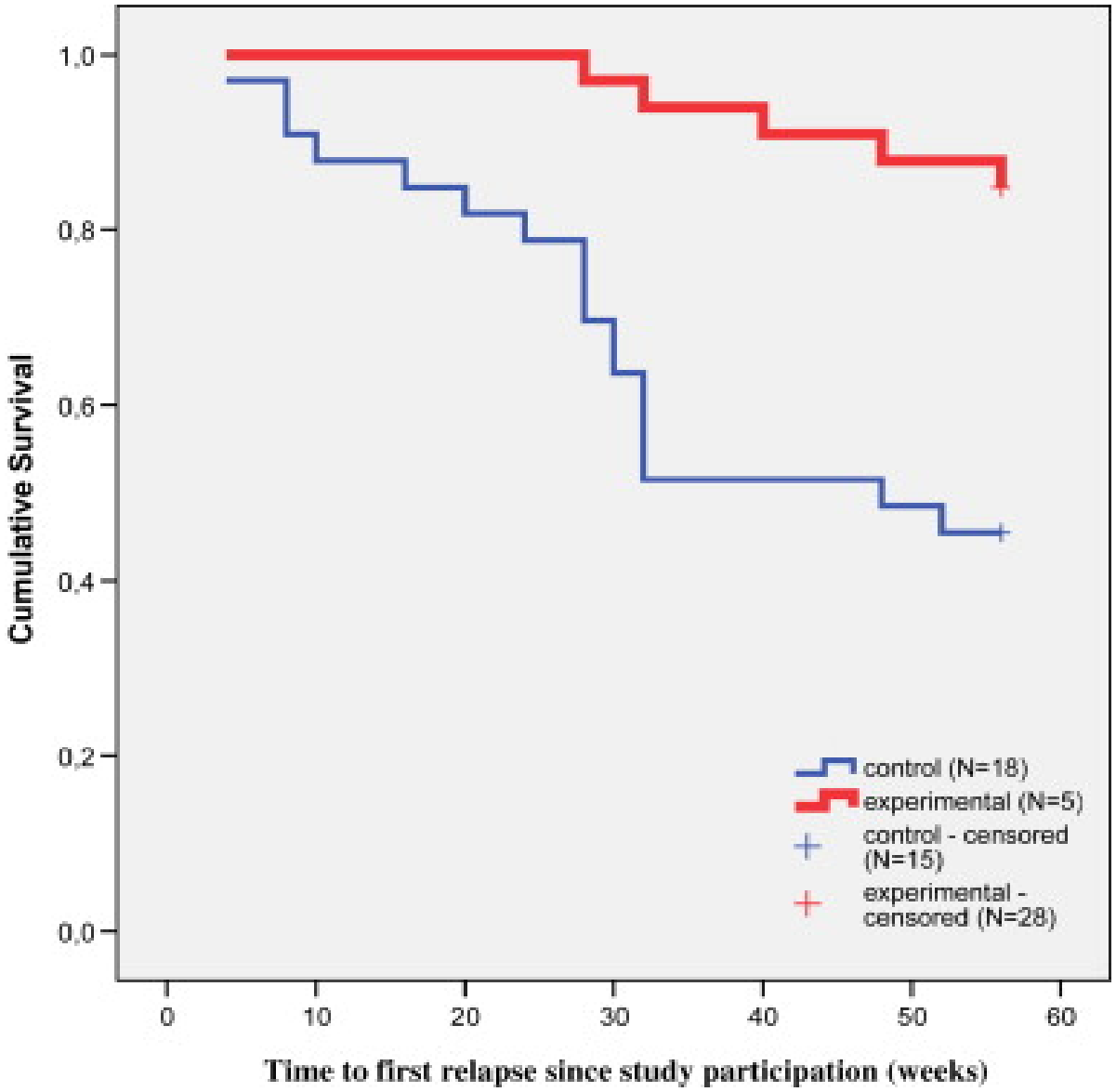
- **Mental health:** E.g. therapeutic application for depression, anxiety, panic disorder, stress, emotional regulation, addiction, sleep problems, eating disorders, psychosis, ADHD, autism, reduced burnout, greater resilience
- **Neuroscience:** E.g. structural and functional changes in the brain, stimulation of neurogenesis, possible prevention of dementia and cognitive decline, down-regulating the amygdala, improved executive functioning and working memory, reduced default mental activity, improved self-monitoring and cognitive control, improved perception of sensory input
- **Clinical:** E.g. therapeutic applications for pain management, symptom control, coping with chronic illness (e.g. cancer and MS), metabolic and hormonal benefits (e.g. reduced allostatic load, cortisol), facilitating lifestyle change (e.g. weight management, smoking cessation), improved immunity (e.g. improved resistance, reduced inflammation), improved genetic function and repair, slower ageing as measured by telomeres
- **Performance:** E.g. sport, academic, leadership qualities, mental flexibility and problem solving, decision-making, sunk-cost bias
- **Education:** E.g. improved problem-solving, executive functioning and working memory, better focus, less behavioural problems, fostering growth mindsets
- **Relationships:** E.g. greater emotional intelligence and empathy, improved communication, reduced vicarious stress and carer burnout
- **Spiritual**



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

MBCT and depression

- RCT investigated the effects of Mindfulness-based cognitive therapy (MBCT) on the relapse in depression, time to first relapse and the quality of life
  - 106 recovered depressed patients with a history of at least 3 depressive episodes
  - Treatment as usual (TAU) vs MBCT plus TAU 1 year f/up
- Relapse/recurrence significantly reduced and the time until first relapse increased in the MBCT plus TAU c/w TAU
- MBCT plus TAU group also showed a significant reduction in both short and longer-term depressive mood, better mood states and quality of the life
  - Godfrin KA, van Heeringen C. The effects of mindfulness-based cognitive therapy on recurrence of depressive episodes, mental health and quality of life: A randomized controlled study. Behav Res Ther. 2010 Aug;48(8):738-46.



Godfrin KA, van Heeringen C. Behav Res Ther. 2010 Aug;48(8):738-46.

Mindfulness and the workplace

- 8 week mindfulness program for ANU staff
- Key findings include:
  - Increased self-rated performance (ECDP)
  - Improved wellbeing (PANAS)
  - Improved eudaimonic wellbeing (meaningfulness) (PWB)
  - Increase in work engagement (vigour and dedication) (UWES)
  - Increased authenticity (self-awareness, authentic behaviour, open relationships) (AI3)
  - Increased satisfaction with life (SWLS)
- Improvements sustained at 6 month f/up
  - Atkins PWB, Hassed C, Fogliati VJ. (2015) Mindfulness Improves Work Engagement, Wellbeing and Performance in a University Setting. In Burke, RJ, Cooper, CL & Page, KM. Flourishing in Life, Work, and Careers, pp 193-209. Elgar, Cheltenham.

Mindfulness, management and work

- Randomized study of the effect of mindfulness on senior managers **found** enhanced participants' self-perception of leadership skills as a bundle of all five skills, and some individual skills
  - Amar AD, Hlupic V, Tamwatin T. Effect of meditation on self-perception of leadership skills: a controlled group study of CEOs. 10.5465/AMBPP.2014.300 ACAD MANAGE PROC January 2014
- People higher in mindfulness less likely to feel frustration, even in unsupportive managerial environments: a protective factor in controlling work environments
  - Schultz PP, Ryan RM, Niemiec CP, Legate N, Williams GC. Mindfulness, Work Climate, and Psychological Need Satisfaction in Employee Well-being. Mindfulness September 25, 2014.
- Mindfulness intervention group had significant decrease in perceived stress but increased mindfulness, resiliency, and vigour
  - Aikens KA, Astin J, Pelletier KR, et al. Mindfulness Goes to Work: Impact of an Online Workplace Intervention. Journal of Occupational & Environmental Medicine. July 2014;56(7):721–731. doi: 10.1097/JOM.0000000000000209
- Interventions should focus on workplaces as well as individuals

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

Distractor influence

- Common scenarios
  - External e.g.
    - Open plan offices
    - Noise, movement in environment
    - Technology
  - Internal e.g.
    - Worries, thoughts, emotions, daydreams, pressure…

Smartphones and cognitive performance

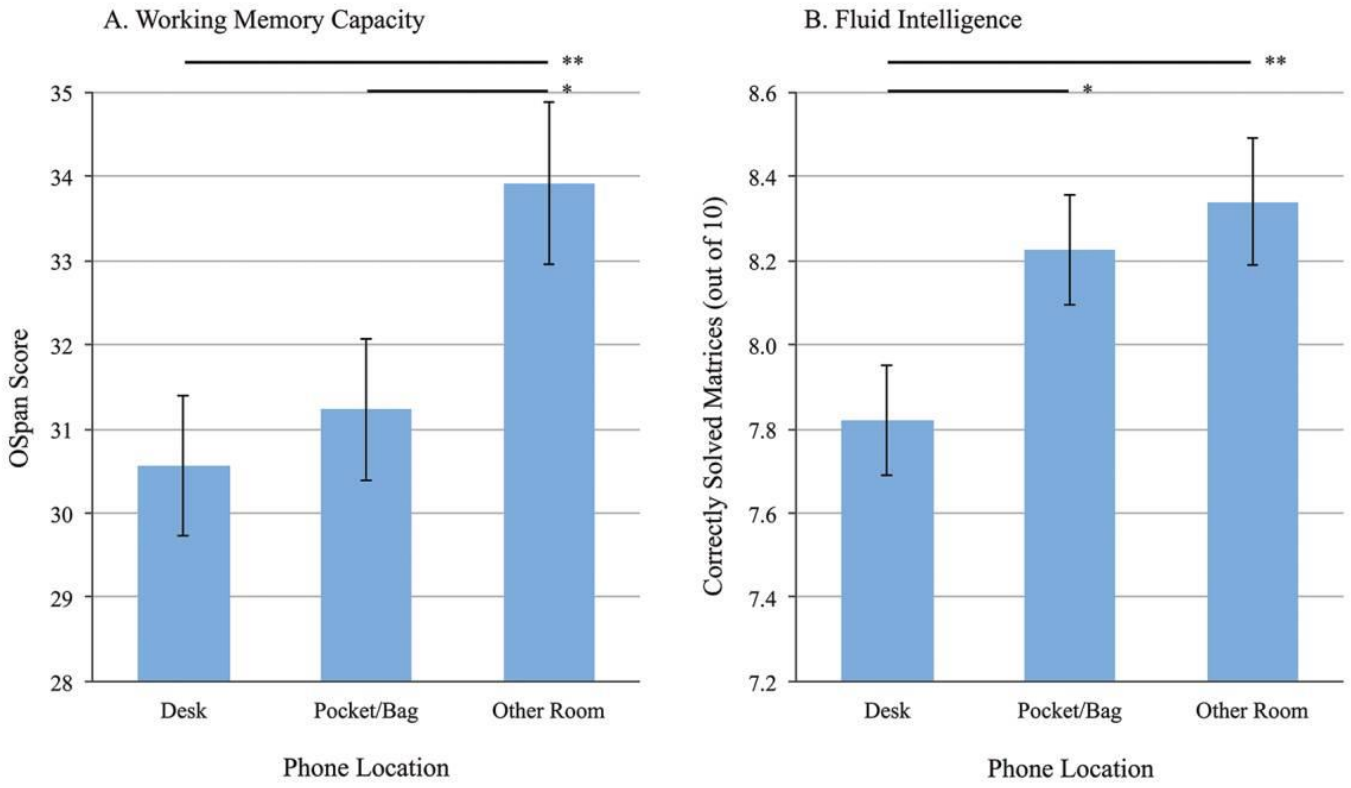
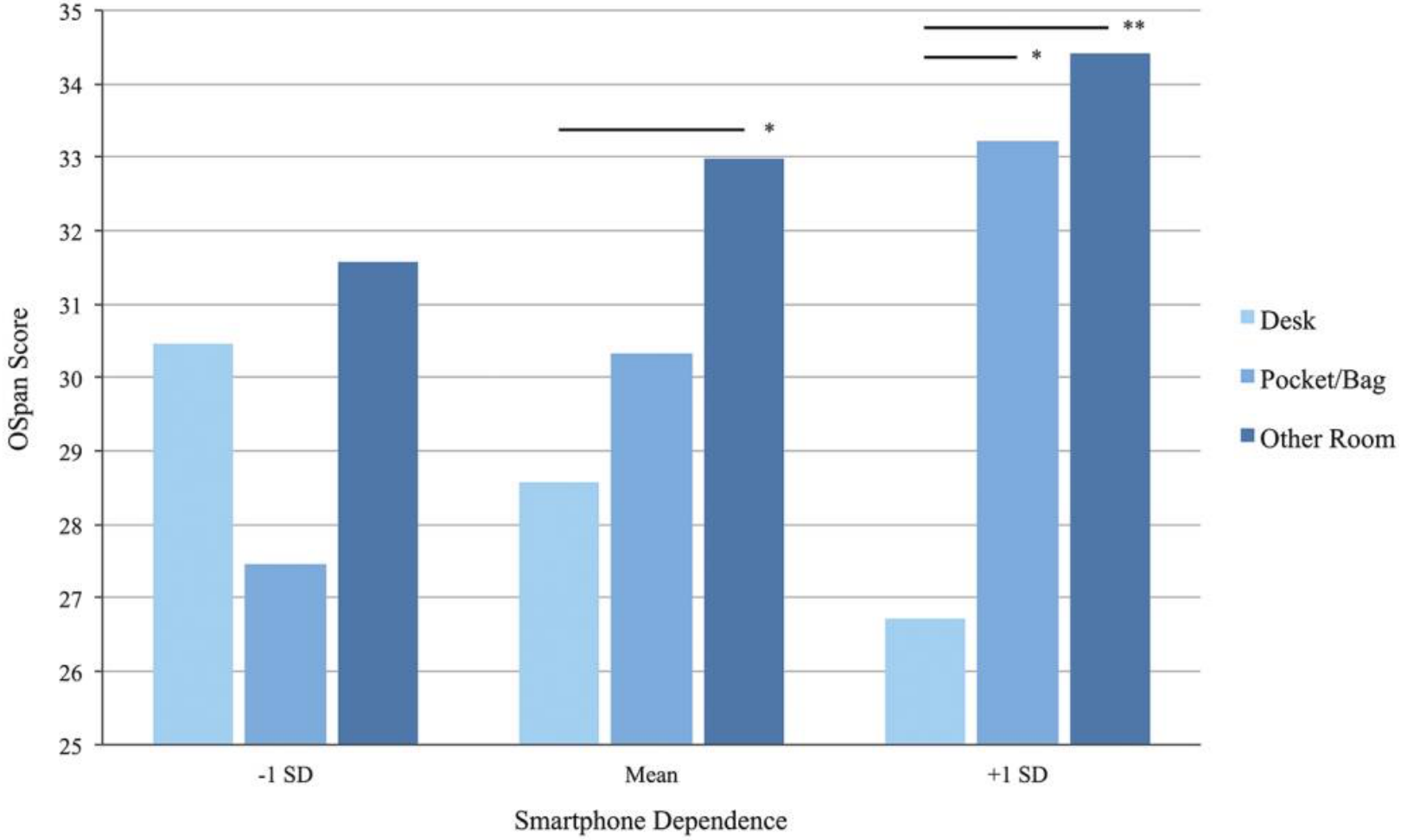


Figure 1. Experiment 1: effect of randomly assigned phone location condition on available WMC (OSpan Score, panel *A*) and functional Gf (Correctly Solved Raven's Matrices, panel *B*). Participants in the "desk" condition (high salience) displayed the lowest available cognitive capacity; those in the "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



Overloaded circuits

- “Bain and Company, the consultancy, has estimated that executives in the 1970s had to deal with fewer than 1,000 phone calls, telexes and telegraphs a year from people outside their company. These days, 30,000 external communications clog managers’ inboxes annually. As Henry Mintzberg asks in his 2009 book, *Managing*: “Might the internet, by giving the illusion of control, in fact be robbing managers of control? In other words, are the ostensible conductors becoming more like puppets?”
  - Financial Times, UK March 5, 2016.

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/
- "We are moving from a world where computing power was scarce to a place where it now is almost limitless, and where 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/

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.

Mobile phone use and motor vehicle accidents

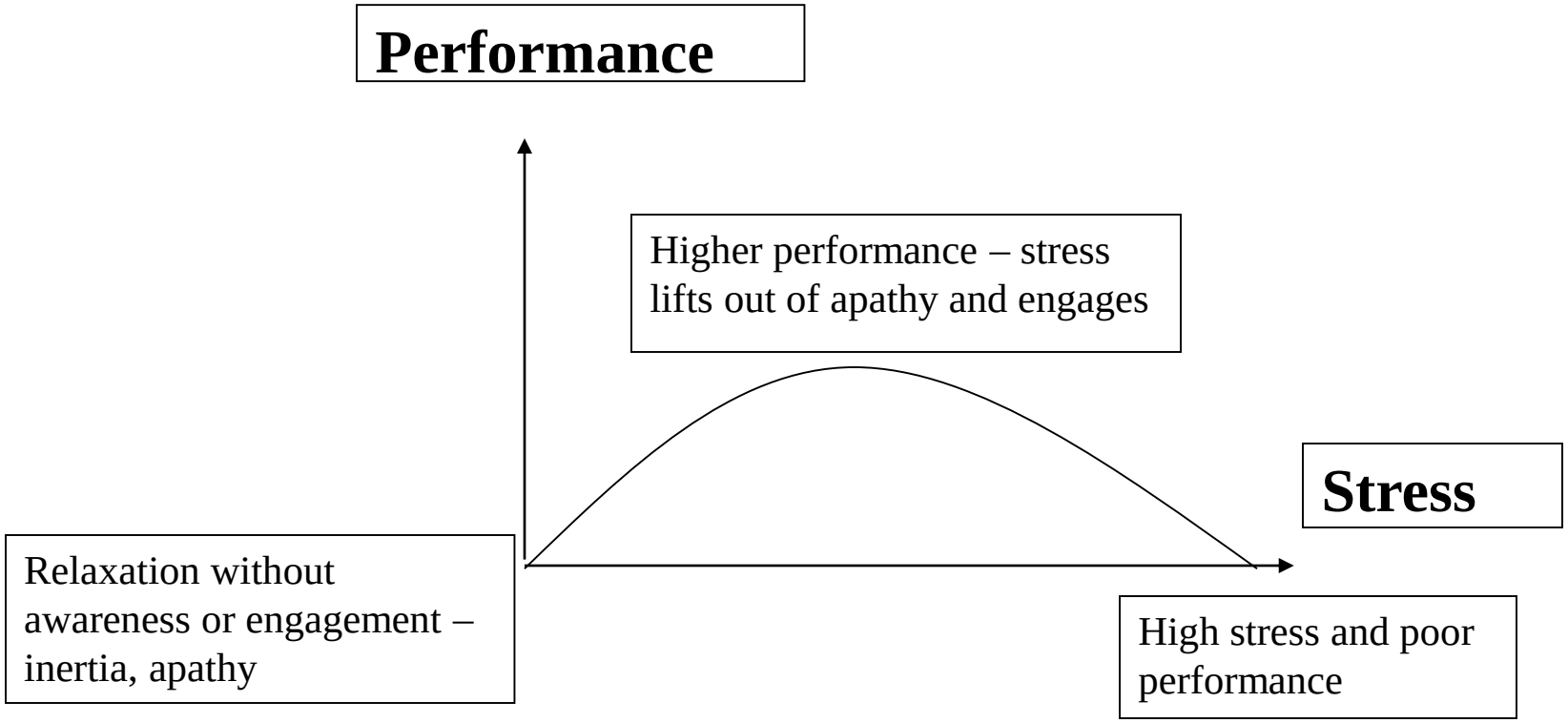
- Driver's use of a mobile phone within 5 min before a crash associated with fourfold increased likelihood of crashing (OR 4.1)
  - McEvoy SP, Stevenson MR, Woodward M.The contribution of passengers versus mobile phone use to motor vehicle crashes resulting in hospital attendance by the driver. Accid 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.

Emotional Intelligence & mindfulness

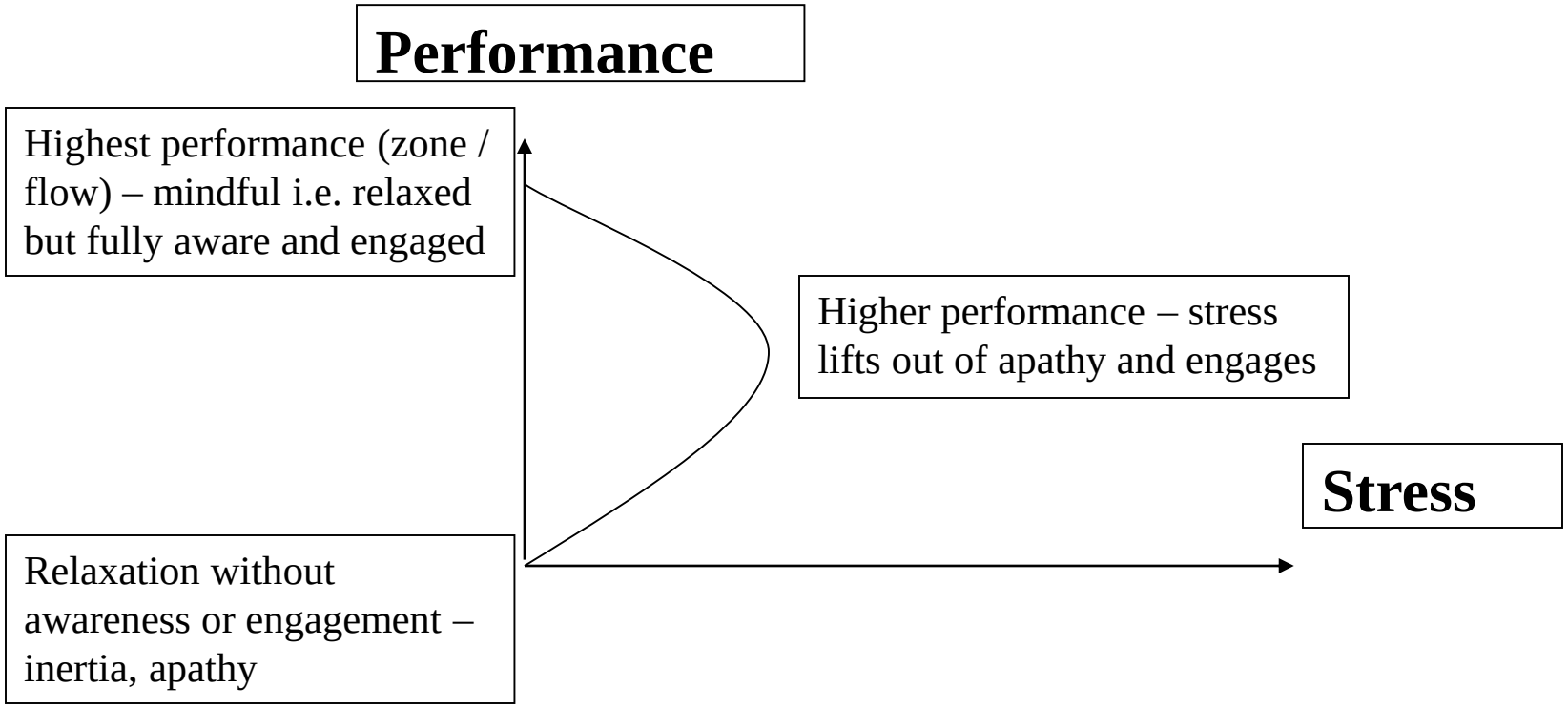
- Mindfulness related to aspects of personality and mental health
  - Lower neuroticism, psychological symptoms, experiential avoidance, dissociation
  - Higher emotional intelligence and absorption
    - Baer RA, et al. Assessment. 2004;11(3):191-206.

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

Yerkes-Dodson Stress-performance curve



Hassed / mindfulness stress-performance curve



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)
- Need to micromanage the attention and the environment e.g.
  - Remove unnecessary distractions / interruptions
  - Control the environment
  - Prioritise where the attention goes – is it urgent?

Mental overload and creativity

- Three experiments: subjects performed a free-association task while the level of mental load was manipulated in various ways
- Subjects with low-load provided significantly more diverse and original associations compared with subjects in the high-load conditions, who exhibited high consensus (predictable, unimaginative, uncreative…)
- Findings imply that activation of associations is narrowed under conditions of high mental load
  - Baror S, Bar M. Associative Activation and Its Relation to Exploration and Exploitation in the Brain. Psychol Sci. 2016 Jun;27(6):776-89. doi: 10.1177/0956797616634487.

Mindfulness and mental flexibility

- Mindfulness leads to:
  - reduced cognitive rigidity via the tendency to be "blinded" by experience
  - “a reduced tendency to overlook novel and adaptive ways of responding due to past experience, both in and out of the clinical setting.”
    - Greenberg J, Reiner K, Meiran N. "Mind the trap": mindfulness practice reduces cognitive rigidity. PLoS One. 2012;7(5):e36206. Epub 2012 May 15.

Bias: the root of decision errors

- 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 'sunk-cost bias'

- Sunk-cost bias: "tendency to continue an endeavour once an investment in money, effort, or time has been made"
- Often underlies escalation of commitment or entrapment
  - Large scale: disastrous military campaigns and over-budget public-works projects are publicly visible examples
  - Small scale: difficulty selling stock that has fallen in value, ignoring bad advice that one has paid for, deleting carefully written text from a manuscript, overstaying in dysfunctional relationships or jobs, gambling
- Sunk-cost bias attenuated by drawing one's focus away from the future and past and reducing negative affect through mindfulness meditation
  - Hafenbrack AC, Kinias Z, Barsade SG. Debiasing the Mind Through Meditation: Mindfulness and the Sunk-Cost Bias. Psychological Science 2014, Vol. 25(2) 369–376.

Practicing mindfulness

- Formal practice
  - Mindfulness meditation
- Informal practice
  - Mindful while engaged in daily activities and work
- Cognitive practices
  - Perception
  - Letting go (non-attachment)
  - Acceptance
  - Presence of mind
- Avoid the enemies of mindfulness e.g.
  - Multitasking
  - Unnecessary switching between complex tasks
  - Cognitive overload
  - Never unplugging

co-author of the bestselling *Mindfulness for Life*

DR CRAIG HASSED
& DR RICHARD CHAMBERS

mindful learning

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- https://www.futurelearn.com/courses/mindfulness-life
  - Collaboration between Monash University and FutureLearn (UK)