Mindfulness, mental health and motivation

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Falling attention spans

- Question: who has the longer attention span?
  - Humans
  - Goldfish

- According to a Microsoft Canada report, the average human’s attention span is below that of a goldfish (8 sec vs. 9 sec)

- “...the true scarce commodity is increasingly human attention”
  - Satya Nadella – CEO Microsoft
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

The ‘online brain’

- Review of psychological and neuroimaging research examined how the Internet may be changing our cognition (thinking) and brain

- Internet can produce short and long-term alterations in areas of cognition and the brain
  a) attentional capacities
  b) memory processes
  c) social cognition

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* [master of themselves] if they have it not. An education which should improve this faculty would be the education *par excellence*.

- William James (1890)
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
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

- 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
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Number of new mindfulness publications in peer-reviewed journals listed on PubMed each year 1980-June 2021.
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
Mindfulness & adolescent mental health

- Meta-analysis of RCTs on efficacy of Mindfulness-based Interventions for children and adolescents’ mental health and cognitive functioning
  - 33 studies including 3,666 children and adolescents included
- Significant positive effects of MBIs for Mindfulness, Executive Functioning, Attention, Depression, Anxiety/Stress and Negative Behaviours
  - When considering only RCTs with active control groups, significant benefits of MBIs on Mindfulness (d=.42), Depression (d=.47) and Anxiety/Stress (d=.18)
- “This meta-analysis reinforces the efficacy of using MBIs for improving the mental health and wellbeing of youth as assessed using the gold standard RCT methodology.”
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
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.”

The Technology Trap

- Digital technology **addictive**
  - Activates same brain circuits as drugs
    - Sansone & Sansone (2013)

- More **classroom mobile use = lower grades**
  - If used recreationally
    - Lepp, Barkley & Karpinski (2015)
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”
Smartphones and cognitive performance

Cognitive Capacity. We assessed the effects of smartphone salience on available cognitive capacity using two measures of domain-general cognitive function: OSpan task performance and RSPM test score. Because both tasks rely on limited-capacity attentional resources, both should be sensitive to fluctuations in the availability of these resources.

A multivariate analysis of variance (MANOVA) testing the effects of Phone Location (desk, pocket/bag, other room) on the optimal linear combination of these measures revealed a significant effect of Phone Location on cognitive capacity (Pillai's Trace = 3.027, $F(4, 1028) = 3.51, p = .007$, partial $\eta^2 = .014$). Paired comparisons revealed that participants in the "other room" condition performed better than those in the "desk" condition (p = .002). Participants in the "pocket/bag" condition did not perform significantly differently from those in either the "desk" (p = .09) or "other room" (p = .11) conditions. However, planned contrasts revealed a significant desk $\rightarrow$ pocket/bag $\rightarrow$ other room linear trend (Pillai's Trace = .023, $F(2, 513) = 6.07, p = .002$, partial $\eta^2 = .023$) and no quadratic trend (Pillai's Trace = .004, $F(2, 513) = .96, p = .39$), suggesting that as smartphone salience increases, available cognitive capacity decreases.

Follow-up univariate ANOVAs separately testing the effect of Phone Location on OSpan performance and RSPM score were consistent with our focal multivariate analysis. Phone Location significantly affected both OSpan performance ($F(2, 514) = 3.74, p = .02$, partial $\eta^2 = .014$) and RSPM score ($F(2, 514) = 3.96, p = .02$, partial $\eta^2 = .015$). See figure 1 for means, and the appendix for detailed analyses and results.

Conscious Thought. A one-way ANOVA on participants' responses to the question "While completing today's tasks, how often were you thinking about your cellphone?" revealed a significant effect of Phone Location (desk, pocket/bag, other room) on conscious thought (p = .007).

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

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**Figure 3.** Experiment 2: estimated marginal means representing the effect of phone location on available cognitive capacity (OSpan Score) at low (-1 SD), mean, and high (+1 SD) levels of smartphone dependence. Phone location affects available cognitive capacity at mean and high levels of smartphone dependence, but not at low levels of smartphone dependence. Asterisks indicate significant differences between conditions, with *p < .05 and **p < .01.
Surveys of 1.1 million US 8th-12th graders showed psychological well-being (self-esteem, life satisfaction, and happiness) decreased after 2012.

Adolescents who spent more time on screens (e.g., social media, Internet, texting, gaming) and less time on non-screen activities (e.g., in-person social interaction, sports/exercise, homework, religious services) had lower psychological well-being.

The happiest teens used digital media for less 1 hr/day but after a daily hour of screen time, unhappiness rises steadily with increasing screen time.

- Twenge JM, Martin GN, Campbell WK. Decreases in Psychological Well-Being Among American Adolescents After 2012 and Links to Screen Time During the Rise of Smartphone Technology. Emotion, 2018; DOI: 10.1037/emo0000403
Internet addiction in teens

- Do young people engage in **compulsive Internet use (CIU)** because of difficulty regulating emotions, does CIU lead to emotion regulation problems, or are they reciprocal?
- Longitudinal study of 2,809 adolescents assessed over 4 years measured relations b/w CIU and emotion regulation
- **CIU preceded development of emotion dysregulation**
  - All subscales moved in a negative direction especially for difficulties setting goals and being clear about emotions
- No evidence that emotion regulation difficulties preceded increases in CIU
Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004)

- 36-item scale comprised of 6 subscales measuring difficulties with:
  a) awareness of emotions (e.g., “I am attentive to my feelings”)
  b) clearly understanding one’s emotions (e.g., “I have no idea how I am feeling”)
  c) accepting one’s emotions (e.g., “When I’m upset, I feel guilty for feeling that way”)
  d) impulsivity (e.g., “When I’m upset, I lose control over my behaviors”)
  e) ability to engage in goal-directed behavior (e.g., “When I’m upset, I have difficulty getting work done”)
  f) self-efficacy in identifying emotion regulation strategies (e.g., “When I’m upset, I believe that there is nothing I can do to make myself feel better”)

“Results demonstrate that more severe, excessive Social Network Site use is associated with more deficient value-based decision making. In particular, our results indicate that excessive SNS users may make more risky decisions.”

Social media & narcissism

- University students followed over 4-months
- “…problematic internet use may serve to discharge narcissistic personality traits for those who use social media in a visual way…”
Social media use and depression

- Study assessed association between Social Media use and depression in 1,787 adults ages 19-32.
- Compared with those in the lowest quartile, individuals in the highest quartile of Social Media site visits/wk and those with a higher global frequency score had significantly increased odds of depression (2.74; 3.05, respectively).
- Strong, linear, dose-response trends
Social Media and mental health

“… social network sites benefit their users when they are used to make meaningful social connections and harm their users through pitfalls such as isolation and social comparison when they are not.”

Emotional Intelligence & mindfulness

- Mindfulness related to aspects of personality and mental health
  - Lower neuroticism, psychological symptoms, experiential avoidance, dissociation
  - Higher emotional intelligence and absorption

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<td>Self-regulation</td>
<td>Can control or redirect disruptive impulses, can think before acting</td>
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<td>Motivation</td>
<td>Passion for work that goes beyond money or status, energy and persistence</td>
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<td>Empathy</td>
<td>Ability to understand emotions of others, skill in interacting with others</td>
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<td>Social skill</td>
<td>Can manage relationships and build networks, can find common ground, rapport</td>
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Comparing practitioners with highest and lowest mindfulness scores, the more mindful:

- More client-centered
- Engage in more rapport building
- Display more positive emotional tone
- More likely to rate highly on communication / have satisfied clients

Mindfulness & prosociality

- Review of studies on link between mindfulness – as both a personality variable and an intervention – and prosocial behavior
- Positive effect b/w mindfulness and prosocial behaviour for both correlational and intervention studies
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.

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.

Mindfulness and exam anxiety

- Reduction of anxiety and improved performance of students on high stakes exams through the application of mindfulness training
- Probably because mindfulness frees up working memory sources occupied by anxious preoccupation
Mindfulness and student performance

- Studies examined effects of mindfulness on the knowledge retention of tertiary students
- Students randomly received either brief meditation training or rest
- Then listened to a class lecture and took a post-lecture quiz that assessed students’ knowledge of lecture material
- Results: meditation improved students’ retention of the information conveyed during the lecture
Stress
Performance

Relaxation without awareness or engagement – inertia, apathy

Higher performance – stress lifts out of apathy and engages

High stress and poor performance

Yerkes-Dodson Stress-performance curve
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
Mindfulness stress-performance curve

**Performance**

- Highest performance (zone / flow) – mindful i.e. relaxed but fully aware and engaged

**Stress**

- Higher performance – stress lifts out of apathy and engages

- Relaxation without awareness or engagement – inertia, apathy
Mindfulness and perseverance

- Action crises: conflicts people face when deciding whether to continue pursuing or to give up a goal for which difficulties keep arising

- Studies show that greater mindfulness predicts fewer action crises due to:
  1. greater intrinsic goal motivation
  2. ability to handle difficult emotions

Further resources

- Free 4-week online mindfulness course – Mindfulness for Wellbeing and Peak Performance
  - [https://www.futurelearn.com/courses/mindfulness-wellbeing-performance](https://www.futurelearn.com/courses/mindfulness-wellbeing-performance)
  - Collaboration between Monash University and FutureLearn