Mindful Learning: why attention matters in education

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“In conclusion, a human mind is a wandering mind, and a wandering mind is an unhappy mind. The ability to think about what is not happening is a cognitive achievement that comes at an emotional cost.”

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

TELOMERES

Embryonic Stem Cell ——

Telomere Long ——

Telomerase Active

Adult Stem Cell ——

Telomere Short ——

Telomerase Inactive or Absent

Telomere is a Repeating DNA Sequence

Google Image modified by Vitetta and Sali
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
Stress and ageing in children

- Study on associations b/w autonomic nervous system and adrenocorticoid (cortisol) reactivity to lab stressors and telomere length (TL) in 5-6y/o children
- Heart rate and cortisol reactivity inversely related to TL
- Children with high sympathetic activation and parasympathetic withdrawal and high cortisol reactivity had significantly shorter TL – a marker of early biologic aging
Mind wandering and ageing

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

Higher TV watching at 3 y/o associated with higher ADHD at age 7

- Friedland RP et al. Proc Nat Acad Sci USA, 10.1073/pnas.061002998
Social media and emotional intelligence

- A field experiment examined whether increasing opportunities for face-to-face interaction while eliminating the use of screen-based media and communication tools improved nonverbal emotion cue recognition in preteens.

- 51 preteens spent five days at a nature camp where TVs, computers, and mobile phones were not allowed, c/w 54 school-based matched controls that retained usual media practices.

- Nature camp preteens’ recognition of nonverbal emotion cues improved significantly but not the control group.

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

“Any man who can drive safely while kissing a pretty girl is simply not giving the kiss the attention it deserves.”
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)
On the performance of extreme multi-taskers

“These are kids who are doing 5, 6, or more things at once all the time. ... It turns out multi-taskers are terrible at every aspect of multitasking! They get distracted constantly. Their memory is very disorganized. Recent work we’ve done suggests that they’re worse at analytic reasoning. We worry that it may be we’re creating people who may not be able to think well, and clearly.”

Multitasking or task-switching?

- Multitasking is an illusion (misnomer)
- Switching happens so fast that it appears we are performing multiple tasks simultaneously like the concurrent performance of several jobs by a computer
- Reality is that we are switching back and forth between tasks
Yerkes-Dodson Stress-performance curve

- **Performance**
  - Relaxation without awareness or engagement – inertia, apathy
  - Higher performance – stress lifts out of apathy and engages

- **Stress**
  - High stress and poor performance
Three regions of the brain

- **Frontal lobes (prefrontal cortex) centre for executive functioning**
  - Attention regulation
  - Working memory
  - Reasoning and decision making
  - Emotional regulation
  - Appetite regulation
  - Impulse control
  - Directs immune system

- **Limbic system – emotion centre**

- **Mesolimbic reward system – appetites**
Exam stress and performance

- High math anxiety led to smaller working memory

- “Performance pressure harms individuals most qualified to succeed by consuming the working memory capacity that they rely on for their superior performance.”
The Default Brain

- Active tasks
  - Tasks associated with paying attention
  - Brain efficient and quiet
- Default state (mode)
  - Mind is inattentive, distracted, idle, recalling past, daydreaming
  - Areas active in default mode similar to areas affected by Alzheimer’s Disease
Murray Rose on mindfulness

- Reporter: Do you have any philosophy on life as an individual?
- MR: I think it revolves around this perhaps secret of concentration on one thing. When you’re eating, you do nothing else but eat. And when you’re swimming, you do nothing else but swim, and I think that by doing that you achieve the greatest satisfaction by devoting your whole self, your whole energies, your whole thoughts to just one activity at a time. And I think that perhaps would be the essence of my personal philosophy.
  - http://www.abc.net.au/austory/content/2012/s3893380.htm
“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 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
  1. Openness
  2. Curiosity
  3. Acceptance
Applications of mindfulness

- **Mental health:** E.g. therapeutic for depression, anxiety, panic disorder, stress, emotional regulation, addiction, sleep problems, eating disorders, psychosis, ADHD, autism, reduced burnout

- **Neuroscience:** E.g. structural and functional changes in the brain, neurogenesis, (dementia prevention), down-regulating the amygdala, improved executive functioning and working memory, reduced default mental activity, improved self-monitoring and cognitive control

- **Clinical:** E.g. pain management, symptom control, coping with chronic illness, metabolic and hormonal benefits, facilitating lifestyle change (e.g. weight management, smoking cessation), improved immunity, enhanced genetic function and repair

- **Performance:** E.g. sport, academic, leadership, mental flexibility

- **Education:** E.g. improved problem-solving, improved executive functioning and working memory, focus, better behaviour

- **Relationships:** E.g. emotional intelligence, communication, empathy

- **Spiritual**
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, adolescents and mental health

- “Mindfulness-based stress reduction (MBSR) program for adolescents age 14 to 18 years with heterogeneous diagnoses in an outpatient psychiatric facility.

- Relative to treatment-as-usual control participants, those receiving MBSR self-reported reduced symptoms of anxiety, depression, and somatic distress, and increased self-esteem and sleep quality.”

    http://dx.doi.org/10.1037/a0016241
Mindfulness in schools

- 522 young people aged 12–16 in 12 secondary schools either participated in Mindfulness in Schools Programme (intervention) or usual school curriculum (control)
- Rates of acceptability were high
- Children who participated in the intervention reported:
  - Fewer depressive symptoms post-treatment and at 3 month f-up
  - Lower stress and greater well-being at f-up
- The degree to which students practised the mindfulness skills was associated with better well-being and less stress at follow-up
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.”
Default mode network

- Default mental activity flourishes in various forms of psychopathology including depression, anxiety, schizophrenia and autism
- Default activity decreased or deactivated when paying attention (e.g. experienced meditators)
- In experienced meditators but not novices, even when the default mode network is active, brain regions associated with self-monitoring and cognitive control are co-activated
  - Reduces vulnerability to default thinking
**Essence program and student wellbeing**

- Study of 2006 cohort of medical students found that 90.5% of students personally applied strategies
- Improved student wellbeing noted on all measures of wellbeing even in the pre-exam period
  - Reduced depression, hostility and anxiety subscale
  - Improved psychological and physical quality of life
Roots of Diagnostic 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
Mindfulness and student performance

- Three studies examined the effects of mindfulness meditation on the knowledge retention of tertiary students.
- Participants from three introductory psychology courses 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 indicated that meditation improved students’ retention of the information conveyed during the lecture in each of the three experiments.

Hassed 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 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.”

Mindfulness and doctor 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
Mindfulness for teachers

- RCT of pilot program of Mindfulness-Based Stress Reduction adapted for teachers
- Mindfulness group showed significant reductions in:
  - psychological symptoms
  - burnout
- Improvements in:
  - observer-rated classroom organization
  - performance on a computer task of affective attentional bias
  - increases in self-compassion
- Control group showed worse cortisol levels and increased burnout
- Changes in mindfulness correlated with improved outcomes (e.g. psychological symptoms, burnout, and sustained attention)
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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<tr>
<th>EI</th>
<th>Definition</th>
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<tr>
<td>Self-awareness</td>
<td>Ability to recognise and understand emotions, drives and effects</td>
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<td>Self-regulation</td>
<td>Can control or redirect disruptive impulses, can think before acting</td>
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<tr>
<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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Self-compassion and performance

- Can treating oneself with compassion after making a mistake increase self-improvement motivation?
- Self-compassion intervention compared to a self-esteem control group, no intervention or a positive distraction control group
- Self-compassion associated with:
  - Greater belief that a personal weakness can be changed for the better
  - Greater motivation to make amends and avoid repeating a moral transgression
  - More time studying for a difficult test following an initial failure
  - A preference for upward social comparison after reflecting on a personal weakness
  - Greater motivation to change the weakness

Mindfulness and cellular ageing

- Meditation may slow genetic ageing and enhance genetic repair
  - “...we propose that some forms of meditation may have salutary effects on telomere length by reducing cognitive stress and stress arousal and increasing positive states of mind and hormonal factors that may promote telomere maintenance.”
mindful learning
Reduce stress and improve brain performance for effective learning

mindfulness FOR LIFE

Foreword by Ian Gawler OAM
Applying mindfulness in the school

- Start with teachers then students and parents
- Formal practice
  - 5-10 minutes to be taken seated b.d. before meals
  - 15-60 seconds p.r.n.
- Informal practice
  - The senses are a gateway to the present moment: listening, eating, walking, reading, learning, communicating…
  - Move through your day one step, moment, job at a time
  - Avoid multitasking
  - Use screen-time discerningly
- Cultivate a mindful attitude
  - E.g. open, curious, flexible, non-attached…
  - Do things in non-habitual ways
  - Look for novelty / differences
- Mindfulness-based cognitive practices
  - Perception
  - Letting go
  - Acceptance
  - Presence of mind
- Contextualise and integrate it in the curriculum