Mindfulness: the science, practice and philosophy

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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
Burnout

Burnout characterised by:

1. Emotional exhaustion (feeling emotionally overloaded with work)
2. Depersonalisation (cynicism, active disengagement from one's job)
3. Decreased personal accomplishment (inefficacy)

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

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
Hostility and telomere length

- High-hostile men had significantly shorter leukocyte TL than their low-hostile counterparts
- The relationship between hostility and disease is stronger in men than in women, and men generally have a shorter life expectancy than women

Mind wandering and ageing

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

Mind wandering and happiness

“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.”

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
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
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
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

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)
Multitasking

“In 2005, the BBC reported on a research study, funded by Hewlett-Packard, and conducted by the Institute of Psychiatry at the University of London, that found, workers distracted by e-mail and phone calls suffer a fall in IQ more than twice that found in marijuana smokers.”

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
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
The default-mode network (DMN) is a major resting-state network that supports most of the baseline brain activity.

DMN cortical hub regions are affected early during Alzheimer's disease (AD) and exhibit high amounts of Aβ (amyloid) deposits.
- Areas include the medial prefrontal cortex, parietal cortex, posterior cingulum, and precuneus.

Due to their constant activity, DMN neurons produce and release more Aβ than occur elsewhere in the brain.

Recent findings provide evidence that the amyloid accumulation and DMN functional alterations are closely linked with the changes of sleep-wake cycle ... and pretangle changes.
Mental stimulation and brain health

- 65 healthy elderly (av. 76.1yrs) c/w 10 patients with Alzheimer Disease (74.8yrs) and 11 young controls (24.5yrs)
- ‘Brain health’ (amyloid deposits) c/w participation in cognitive activities (e.g. reading, writing, playing games)
- Greater participation in cognitively stimulating activities (particularly in early and middle life) associated with reduced amyloid uptake
  - The top ¼ of older participants for cognitive activity had amyloid uptake comparable to young controls
  - The lowest ¼ for cognitive activity had amyloid uptake comparable to patients with AD
“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. depression relapse prevention, anxiety, panic disorder, stress, emotional regulation, addiction, sleep, eating disorders, psychosis

- **Neuroscience**: E.g. structural and functional changes in the brain, neurogenesis, (dementia prevention) amygdala, executive function, working memory

- **Clinical**: E.g. pain management, symptom control, cancer, metabolic, hormonal, lifestyle change (e.g. weight management, smoking cessation), genetic function and repair

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

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

- **Spiritual

Results suggest that MBSR may help a broad range of individuals to cope with their clinical and non-clinical problems. Grossman P. J Psychosomatic Research. 2004;57(1):35-43.
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
Default mode network

- High default mental activity in psychopathology (e.g. depression, anxiety, schizophrenia and autism)
- Default activity decreased or deactivated when paying attention (e.g. experienced mindfulness meditators)
- In experienced meditators even when default network active, regions associated with self-monitoring and cognitive control are co-activated: reduced vulnerability to default thinking
Mindfulness, depression and the stress response

- Mindfulness negatively correlates with depressive symptoms and reactivity of the amygdala
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.”
Mindfulness and the brain

- Change in gray matter concentration (GMC) within the cluster in the left hippocampus from the Pre to the Post time-point in the MBSR and the control group; error bars show 95% confidence interval.

Mindfulness and craving

- Study on the effectiveness of suppression vs. mindfulness-based strategy for coping with cigarette cravings
- 61 participants randomly assigned
- Both groups reported significantly reduced amount of smoking and increased self-efficacy in coping with smoking urges at 7-day follow-up
- Only participants in the mindfulness group demonstrated reductions in negative affect, depressive symptoms, and marginal reductions in their level of nicotine dependence
Is heart disease reversible?

- The medical dogma for generations has been that heart disease is an irreversible, chronic condition.

- The truth is that heart disease is reversible given the right lifestyle:
  - Significant improvement possible in both the disease progression and quality of life.

- Study on people with already well established CVD given conventional medical management plus or minus an intervention (comprehensive lifestyle program):
The Ornish Program

- People followed angiographically and symptomatically

- The program (intervention) consisted of:
  - group support
  - stress management including meditation and yoga
  - a low saturated fat vegetarian diet
  - moderate exercise
  - stopping smoking

- Stress management and group support central to being able to improve other lifestyle risk factors
Results at 1 year

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<thead>
<tr>
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<th>Intervention</th>
<th>Control</th>
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<tbody>
<tr>
<td><strong>Progression</strong></td>
<td>82% regressed</td>
<td>53% progressed</td>
</tr>
<tr>
<td><strong>Symptom frequency</strong></td>
<td>91% ▼</td>
<td>165% ▲</td>
</tr>
<tr>
<td><strong>Duration</strong></td>
<td>42% ▼</td>
<td>95% ▲</td>
</tr>
<tr>
<td><strong>Severity</strong></td>
<td>28% ▼</td>
<td>39% ▲</td>
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Reduction in healthcare costs

- $3,900 for the Ornish program
- C/w $40,000 for bypass surgery
- Average cost savings were $US58,000 per patient after 3 year follow-up
Five year follow-up of Ornish program

- Most of the original intervention group maintained changes.
- Outcome for Ornish group was even better blood flow through the coronary arteries vs. decline in control group.
- 2.5 times the risk for cardiac events in control group.
Ornish program for cancer

- Men with early prostate cancer (biopsy and raise PSA) who chose not to have treatment (watch and wait)
- 92 patients randomised to lifestyle (experimental) group vs. usual treatment (control) group

Ornish lifestyle intervention

- Vegan diet
  - Fruits, vegetables, whole grains, legumes and soy
  - 10% calories from fat
  - Supplemented by soy (tofu), fish oil (3gm daily), vitamin E (400IU daily), selenium (200mcg daily), vitamin C (2gm daily)

- Exercise
  - Walking 30min 6 times weekly

- Stress management
  - Gentle yoga, meditation, breathing and PMR

- Support group 1 hour weekly
PSA readings

- Mean changes in PSA (ng/ml) after 1 year
- PSA decreased by 4% in experimental group and increased by 6% in control group
Level of lifestyle change and PSA

Lifestyle and risk of chronic illness

- Low level adherence has little beneficial effect on outcome.
- Medium level of adherence associated with progression but significantly slower than expected.
- High level of adherence associated with reversal of chronic diseases not thought to be reversible.
- If you don’t do the average thing then don’t expect the average prognosis.
Ornish lifestyle intervention

- 2-year follow-up
  - 27% (13/49) patients in control group have gone on to require cancer treatment because of disease progression but only 5% (2/43) patients in lifestyle group

- Ornish program down-regulated prostate cancer gene expression

- Comprehensive lifestyle change increased genetic repair (telomerase activity)
Lifestyle change and telomeres

- 5 year follow-up study to investigate long-term effects of lifestyle change on telomere length on men who had biopsy-proven low-risk prostate cancer
- Telomere length increased from baseline in the lifestyle intervention group, but decreased in the control group
- Adherence to lifestyle change significantly associated with relative telomere length
“Overcoming MS”

Prof George Jelinek

- http://overcomingmultiplesclerosis.org

Lifestyle and self-help therapies for MS

Lifestyle and MS

- Study on 5-day residential retreat for people with MS (based on Prof Jelinek’s Overcoming MS program) promotes lifestyle modification within a patient-centred model of care

- Analysis of the health-related quality of life (HRQOL) of the retreat participants was undertaken using the MSQOL-54, prior to attendance, 1 and 5 years after the retreat

- 274 retreat participants (71%) completed baseline questionnaires
Lifestyle and MS

- Participants demonstrated clinically and statistically significant improvements in HRQOL.

- At 1 year median improvements of 11.3% in overall QoL:
  - 18.6% in the physical health
  - 11.8% in the mental health

- At 5 years there was a 19.5% median improvement in overall QoL compared to baseline:
  - 17.8% in the physical health
  - 22.8% in the mental health

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.

Mindfulness and work engagement

- Study on 2013 cohort of year 1 Monash medical students

- Post mindfulness program:
  - Large increases in dispositional mindfulness
  - Increases in study engagement (UWES; medium effect size)
    - Increases in study dedication and vigour
  - No increase in depression, anxiety or stress in pre-exam period c/w early semester prior to mindfulness program

The zone: Billie-Jean King

“...It almost seems as though I’m able to transport myself beyond the turmoil on the court to some place of total peace and calm... I appreciate what my opponent is doing in a detached abstract way. Like an observer in the next room... It is a perfect combination of (Intense) action taking place in an atmosphere of total tranquility. When it happens, I want to stop the match and grab the microphone and shout that’s what it’s all about, because it is. It is not the big prize I’m going to win at the end of the match or anything else... When I’m in that kind of state... I feel that tennis is an art form that’s capable of moving both the players and the audience.”

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
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

Self-monitoring leads to:

1. Early recognition of cognitive biases
2. Avoidance of technical errors
3. Awareness of emotional reactions
4. Facilitation of self-correction
5. Development of therapeutic relationships

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Epstein R et al, 2008
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.”

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
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
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-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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<tr>
<td>Social skill</td>
<td>Can manage relationships and build networks, can find common ground, rapport</td>
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Mindfulness and healthcare quality

- Observational study of clinicians caring for patients
- Measured patient-clinician communication quality and patient ratings
- Comparing clinicians with highest and lowest mindfulness scores: high-mindfulness clinician consultations:
  - Patient-centered pattern of communication (OR 4.14)
  - 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

Mindfulness, exercise & the cold

- RCT evaluating effects of meditation or exercise on incidence, duration, and severity of acute respiratory infection (ARI)
- Adults >50 years randomized to 1 of 3 study groups:
  - 8-week training in mindfulness meditation,
  - 8-week training in moderate-intensity sustained exercise
  - control (no intervention)

- ARIs and days of illness:
  - Control group: 40 ARIs and 453 illness days
  - Exercise group: 26 ARIs and 241 illness days
  - Meditation group: 27 ARIs and 257 days of ARI illness

- ARI symptom severity
  - 358 for control
  - 248 for exercise
  - 144 for meditation

- Days off work
  - 67 missed in the control group
  - 32 in the exercise group
  - 16 in the meditation group
Meditation and compassion

- Limbic brain regions implicated in empathic response to another's pain
- Meditators have more active empathic response
  - Activation in insula greater in expert than novices
- Empathy w/o stress reduces carer fatigue
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