Mindfulness for Life:
why it matters for cancer

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The mind and body

“You ought not to attempt to cure the body without the soul (psyche) for this is the great error of our day (400BC), in the treatment of the human body, that physicians separate the soul from the body.”

- Attributed to Socrates by Plato in Charmides
Allostatic load

- Prolonged stress leads to wear-and-tear on the body (allostatic load)
  - Mediated through the Sympathetic Nervous System

- Allostatic load leads to:
  - Immune dysregulation (more inflammation / less defense)
  - Atherosclerosis, metabolic syndrome, osteoporosis
  - Atrophy of brain neurons
    - **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, anxiety, anger, stress…
TELOMERES

Embryonic Stem Cell

Telomere Long

Telomerase Active

Telomere is a Repeating DNA Sequence

Adult Stem Cell

Telomere Short

Telomerase Inactive or Absent

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
Genetic ageing and pessimism

- The combination of lower optimism and higher pessimism increases risk for disease and early mortality
  - Sample of healthy post-menopausal women

- Pessimism is independently associated with over 10 years accelerated ageing
  - Shorter Telomere length and higher Interleukin-6 concentrations

Telomere length and cancer risk

- Short telomere length at baseline associated with cancer risk independently of other risk factors

- Incidence rates were:
  - 5.1 per 1000 person-years in the longest telomere length group
  - 14.2 in the middle length group
  - 22.5 in the shortest length group

- Short telomere length also associated with high cancer mortality (2.13)

- “There was a statistically significant inverse relationship between telomere length and both cancer incidence and mortality.”

Mind wandering and ageing

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

Does ‘stress’ cause cancer?

- Yes and no depending on how you define it, measure it and the person experiencing it.

- Meta-analysis to verify association b/w stressful life events and primary breast cancer incidence:
  - Widowhood: RR1.04
  - Divorce: RR1.03
  - Self-rated intensity/frequency of stress: RR1.73
Stress and perception

“Man is not disturbed by events but by the view he takes of them.”

Epictetus
Depression and risk of cancer

- Chronically poor mental health is associated with an increased risk of cancer independent of other risk factors.

- “After adjustment for age, sex, race, disability, hospital admissions, alcohol intake, and smoking, the hazard ratio for cancer associated with chronically depressed mood was $1.88$. The excess risk of cancer associated with chronic depression was consistent for most types of cancer and was not specific to cigarette smokers. ... When present for at least 6 years, depression was associated with a generally increased risk of cancer.”

Melatonin and cancer

Produced by pineal gland
- Setting the body clock
- Antioxidant
- Immunomodulator
- Antitumor, anticytokine, anti-insomnia, anticachexia
- Improves survival in advanced cancer
- Reduces radiation and chemotherapy-induced toxicity

Enhanced by:
- meditation
- sunlight
- subdued lighting after sunset
- calorie restriction
- exercise
- foods rich in Ca, Mg, B6, niacinamide
- tryptophane rich foods
Which of the following is associated with greatest self-reported happiness?

A. Mind wandering to unpleasant topics  
B. Mind wandering to neutral topics  
C. Mind wandering to pleasant topics  
D. Mind not wandering from what one is currently doing

Answer D
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.”

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...
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

What is mindfulness?

“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
Attention regulation

- 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

- Mindfulness is not a method of distraction

- The anxious, stressed, depressed mind is the distracted state – mindfulness is the remedy
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, weight management, genetic function and repair

- **Performance**
  - E.g. sport, academic, leadership

- **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 life
Mindfulness and cancer

- Controlled trial demonstrated:
  - Significantly lower scores on Total Mood Disturbance and subscales of Depression, Anxiety, Anger, and Confusion but more Vigor
  - Fewer overall physical and stress symptoms
  - 65% reduction in mood disturbance and a 31% reduction in stress

- Associated with decrease in afternoon cortisol level
  - Cortisol one of the stress hormones: a prognostic factor for outcomes for cancer patients
Mindfulness and immunity

- Cancer patients: significant improvements seen in overall quality of life, symptoms of stress, and sleep quality
  - Results are consistent with a shift in immune profile from one associated with depressive symptoms to a more normal profile
  - Lower levels of inflammatory hormones (interleukins) which can accelerate cancer growth

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, 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
Chronic pain

- Significant reduction in pain, fatigue, and sleeplessness; and improved function, mood state, and general health following an 8-week intervention for people with fibromyalgia

- Both groups registered statistically significant improvements in pain management and depression for Fibromyalgia patients
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
Weight management and mindfulness

- Participants in mindful eating program showed significant increases in measures of mindfulness and cognitive restraint around eating.
- Significant decreases in weight, eating disinhibition, binge eating, depression, perceived stress, physical symptoms, negative affect, and C-reactive protein.
- “This study provides preliminary evidence that a eating focused mindfulness-based intervention can result in significant changes in weight, eating behavior, and psychological distress in obese individuals.”

Ornish program for cancer

- 92 men with early prostate cancer who chose to watch and wait
- 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

- After 1 year PSA decreased by 4% in experimental group and increased by 6% in control group.
- No patients in the lifestyle group had gone on to have aggressive prostate cancer vs. 6 in the control group.
- The more people applied the program the better their outcome.

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)
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>
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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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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
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.”
Meditation, mental health and telomerase

- Study of effect of brief daily yogic meditation on mental health, cognitive functioning, and immune cell telomerase activity in family dementia caregivers (mean age 60) with mild depressive symptoms
  - Randomized to Kirtan Kriya vs. listening to relaxation music for 12 min/d for 8 weeks
- The meditation group showed significantly lower levels of depressive symptoms and greater improvement in mental health and cognitive functioning c/w relaxation group
- Meditation group showed 43% improvement in telomerase activity c/w 3.7% in the relaxation group (p = 0.05)
- Improvement in mental health “is accompanied by an increase in telomerase activity suggesting improvement in stress-induced cellular aging.”