Objectives

• Distinguish between the effects of acute and chronic stress on health
• Briefly explain how stress affects memory loss, Alzheimer’s risk, various dementias, and promotes burnout.
• Describe at least two symptoms of burnout.
• List at least two protective practices to lessen or mitigate stress effects on cognition and burnout.
• Explain the difference between mindfulness and meditation.
• Explore at least two stress reduction practices.
What is Stress?

- Emotional
- Physiological
- Environmental

- Stress is not what happens to you, but how you react to what happens

- “...demands exceed personal and social resources the individual is able to mobilize.” RS Lazarus

- Change can induce a stress response.

Acute vs Chronic

**Acute**
- “Fight or flight”
- Response to physical threat

**Stress Hormones**
- Adrenalin
- Cortisol

**Chronic**
- Psychological
- Interpersonal
Organ Responses

Effects – Chronic Stress

• Nervous System
  – Increased blood pressure, heart rate, platelet activity

• Endocrine - Increased cortisol &
  – Increased blood sugar
  – Increased insulin
  – Increased cholesterol
  – Impaired cognition

• Immune
  – Susceptibility to infection
Conditions & Chronic Stress

- Depression
- CVD
- HIV/AIDS
- Upper respiratory tract infections
- Asthma
- Herpes viral infections
- Auto-immune diseases
- Wound healing
- Anorexia nervosa
- Panic disorder
- Obsessive-compulsive disorder
- Malnutrition
- Hyperthyroidism
- PMS
- Vulnerability to addiction
Stress and Cognitive Efficiency

![Graph of Stress and Performance](image)

- Low Stress: Boredom
- High Stress: Anxiety
- Optimal Cognitive Efficiency

Performance vs. Stress

- Low Performance
- High Performance
Stress and the Brain

The brain under stress: structural remodeling

Prefrontal cortex
Atrophy

Hippocampus atrophy

Amygdala
Hippocampus

Amygdala, hypertrophy and later atrophy

McEwen 2006
Stress and the Brain

Control

Chronic stress

Prefrontal cortex and hippocampus

Control

Chronic stress

Amygdala and orbitofrontal cortex

Davidson & McEwen 2012
Alzheimer’s Pathology

- Cortical atrophy
  - Amyloid accumulation
  - Synaptic dysfunction
  - Neuronal loss
- Sulcal widening
- Gyral atrophy
- Cortical ribbon thinning
- Ventricular enlargement
- Initial entorhinal cortex involvement
  - Trans-synaptic spread to hippocampus

PLoS1, Lui et al 2012
Toward defining the preclinical stages of Alzheimer’s disease: Recommendations from the National Institute on Aging and the Alzheimer’s Association workgroup Alz & Dementia 2011
So, stress hurts the brain. Any antidotes?
Mindfulness

• Relationship with Eastern meditation practices
  – Not tethered to them
  – Unconstrained to ideologies/beliefs
• Resting of attention in the present moment
• “Here and now” vs “then and there”
• Core components of openness to whatever the present moment contains
  – Non-judgmental
  – Gentleness
  – Curiosity
  – Acceptance
• Engagement over avoidance
Mindfulness

• ‘Doing’ versus ‘Being’
  – Habits versus intentions
  – Passive recipient versus active receiver
  – Avoiding verses approaching
  – Fusion of thoughts and reality versus thoughts being thoughts
  – Striving versus flowing
Mindfulness

• **Is not:**
  – Escape
  – A different form of avoidance
  – Emptying the mind of all thoughts
  – Competitive
  – A relaxation technique
  – Exclusive
  – Dogmatic
“Mindfulness means paying attention in a particular way: on purpose, in the present moment, and non-judgmentally.” (Kabat-Zinn, 1994)

“Life can be found only in the present moment. The past is gone, the future is not yet here, and if we do not go back to ourselves in the present moment, we cannot be in touch with life.” – Thich Nhat Hanh
WHAT IS
(here and now)

WHAT WAS
(then and there)

WHAT IF
(where and when)
Mindfulness

• Core attitudes (Kabat-Zinn, 1990):
  – Non-judging
  – Patience
  – Beginners Mind
  – Trusting
  – Non-striving
  – Acceptance
  – Freedom from attachment
Mindfulness

• Practice, not Mastery
  – Meditation
  – Body Scan
  – Breath
  – Sounds
  – Movement
  – Enhanced awareness
    • Body
    • Mind
    • World
Mindfulness-Based Stress Reduction

- Stress Reduction Clinic at U. Mass Medical Center; Jon Kabat-Zinn, PhD - 1979
  - Stress — job, family or financial
  - Chronic pain and illness
  - Anxiety and panic
  - GI distress
  - Sleep disturbances / Fatigue
  - High blood pressure
  - Headaches

- Center for Mindfulness in Medicine, Health Care, and Society

- One application
  - Identify and disengage from negative thinking
Mindfulness Based Clinical Applications

- **Mindfulness-Based Stress Reduction (MBSR)**
Mindfulness Based Clinical Applications

- **Mindfulness-Based Cognitive Therapy (MBCT)**
Mindfulness Based Clinical Applications

• Mindfulness-Based Programs for Substance Use


How the Mind Processes Pain

ANTERIOR CINGULATE CORTEX
Registers unpleasant feelings when things go wrong, either physically or emotionally. People who are highly sensitive to pain have greater activity here.

SOMATOSENSORY CORTEX
Registers which body part is in pain and the intensity of that pain. Less activity here when patients focus their attention away from their pain.

INSULAR CORTEX
Integrates sensory, emotional and cognitive states; feels empathy for others’ pain.

THALAMUS
Receives pain signals from spinal cord and relays them to higher brain regions.

PERIAQUEDUCTAL GRAY
An area rich in natural opioids that act as a pain reliever.

AMYGDALA
Anticipates pain and reacts to perceived threats.

PREFRONTAL CORTEX
Processes pain signals rationally and plans action. Active when trying to consciously reduce pain.

MEDIAL PREFRONTAL CORTEX
Focuses on negative personal implications of pain. Heightened activity seen in anxious people.

RIGHT LATERAL ORBITOFRONTAL CORTEX
Evaluates sensory stimuli and decides on response, particularly if fear is involved. Mindfulness meditation calms down this response.

NUCLEUS ACCUMBENS
Releases dopamine and serotonin during pleasure or pain.

Therapeutic Approaches

- **44%**: Decrease in pain reported by 15 undergraduates when they focused on a loved one’s photo while exposed to a heated probe.

- **40%**: Decrease in pain intensity reported by 15 people who learned mindfulness meditation and used it while exposed to a heated probe.

- **30%**: Percentage of people in a study of 422 fibromyalgia patients who reported less pain after receiving cognitive behavioral therapy.

Sources: Sean Mackey, Stanford; PLoS One; Journal of Neuroscience; Archives of Internal Medicine
“Could we up the dosage? I still have feelings.”
Variation in Cortical Volume

A

Young

B

Old

C

Old
Meditation and Cognition

• **Changes in cortical structures** (Marciniak et al., 2014)
  - White matter
    - Brain stem
    - Putamen
    - Frontal lobes
  - Function
    - Frontal
    - Parietal
  - Default mode network

• **Changes in cognitive skills** (Chiesa et al., 2011)
  - Processing speed
  - Attention
    - Selective vs. divided
  - Working memory
  - Executive function
    - Mental flexibility
<table>
<thead>
<tr>
<th>Study</th>
<th>Intervention</th>
<th>n</th>
<th>Mean age ± SD</th>
<th>Experience with meditation</th>
<th>Loci with increased cortical thickness</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lazar et al. (2005)</td>
<td>Various</td>
<td>20</td>
<td>38.2</td>
<td>9.1 ± 7.1 years, 6.2 ± 4 h per week</td>
<td>Anterior insula, parts of frontal lobe, auditory cortex in temporal lobe</td>
<td>Somato-sensory, auditory, and interceptive processes</td>
</tr>
<tr>
<td>Pagnoni and Cekic (2007)</td>
<td>Zen</td>
<td>13</td>
<td>37.2 ± 6.9</td>
<td>&gt;3 years per day</td>
<td>Putamen</td>
<td>Attention</td>
</tr>
<tr>
<td>Holzel et al. (2008)</td>
<td>Vipassana</td>
<td>20</td>
<td>34.1 ± 4.7</td>
<td>8.6 years, 2 h daily</td>
<td>Anterior insula, right hippocampus, left inferior temporal gyrus</td>
<td>Anterior insula – awareness of internal experience</td>
</tr>
<tr>
<td>Vестергаард-Пулсен et al. (2009)</td>
<td>Tibetan Buddhism</td>
<td>10</td>
<td>55 ± 6.2</td>
<td>16.5 ± 5.1 years</td>
<td>Medulla oblongata, anterior cerebellum, superior, and inferior frontal gyrus</td>
<td>Breath control, resistance to stress, attention, calmness</td>
</tr>
<tr>
<td>Luders et al. (2009)</td>
<td>Various</td>
<td>22</td>
<td>53 ± 11.5</td>
<td>24 ± 12 years</td>
<td>Orbito-frontal cortex, right thalamus, left inferior temporal gyrus</td>
<td>Regulation of emotions and sensory functions</td>
</tr>
<tr>
<td>Grant et al. (2010)</td>
<td>Zen</td>
<td>17</td>
<td>37.6 ± 10.9</td>
<td>&gt;1000 h</td>
<td>Anterior cingulate cortex, secondary somato-sensory cortex</td>
<td>Anterior cingulate cortex – adaptive control of behavior</td>
</tr>
<tr>
<td>Holzel et al. (2011)</td>
<td>MBSR</td>
<td>16</td>
<td>39 ± 4</td>
<td>0</td>
<td>Left hippocampus, posterior cingulate cortex, temporo-parietal junction, cerebellum</td>
<td>Learning, memory, regulation of emotions, empathy</td>
</tr>
<tr>
<td>Luders et al. (2013b)</td>
<td>Various</td>
<td>50</td>
<td>51.4 ± 12.8</td>
<td>20 years</td>
<td>Hippocampus, especially subiculum</td>
<td>Subiculum – regulation of stress</td>
</tr>
<tr>
<td>Grant et al. (2013)</td>
<td>Zen</td>
<td>18</td>
<td>37.1 ± 10.9</td>
<td>&gt;1000 h</td>
<td>Cingulo-fronto-parietal network</td>
<td>Attention</td>
</tr>
</tbody>
</table>

*n, number of subjects, SD, standard deviation, MBSR, mindfulness-based stress reduction, IBMT, integrative body mind training.*
Meditation and the Brain

Hölzel et al., 2007
• **Reduction of risk factors**
  – Hypertension (Anderson et al., 2008)
  – Cholesterol (Walton et al., 2004)
  – Depression (Beadreau, 2008)
  – Anxiety (Beadreau, 2008)

• **Improved perfusion** (Newberg et al, 2001)

• **Protected white matter networks** (Pagoni, 2007)

• **Inflammatory modulation** (Luders et al., 2013)

• **Decreased stress hormones** (Jacobs, 2013)

• **Downstream effects**
  – Alcohol?
Meditation and the Brain

Marciniak et al., 2014
Meditation and Alzheimer’s


- 8 week meditation program
  - Relaxation (music) control
- N = 15
  - Normal control (n=7)
  - MCI (n=5)
  - AD (n=3)

- Improved perfusion
  - Prefrontal and auditory cortex
- Reduced perfusion (parietal)
- Improved cognition
  - Verbal fluency, divided/working attention, declarative memory
Meditation and AD

Pre-Program Baseline

Post-Program Baseline

PFC

Ant Cingulate

Newberg et al., 2010
Meditation and AD


- 8 week MBSR program

- **Sample = 14 MCI**
  - Randomized to MBSR or UC

- **Increased functional connectivity**
  - Posterior cingulate cortex and bilateral medial prefrontal cortex
  - PCC and left hippocampus

- **Decreased bilateral hippocampal volume atrophy (trend)**
(Wells et al. 2013)
Stress, Care-givers, Burnout

• Burnout defined
• Relation to stress and outcomes
• Overview of practices
Occupational Burnout

“a state of physical, emotional or mental exhaustion combined with doubts about your competence and the value of your work”

See Mayo Clinic

• http://www.mayoclinic.org/healthy-lifestyle/adult-health/in-depth/burnout/art-20046642
Whose at risk?

People who

• lack a reasonable balance between work and personal life
• try to be everything to everyone
• work in a helping profession (e.g., health care, counseling, teaching)
• have little or no control over their work
• have monotonous jobs
Symptoms

- Cynicism, criticality
- Irritable, impatient
- Lack energy to be consistently productive
- Difficulty getting to work and starting tasks
- Dissatisfaction
- Disillusioned about job
- Using food, drugs or alcohol to feel better or not feel
- Changed sleep habits or appetite
- Unexplained headaches, backaches or other physical complaints
Consequences

- Excessive stress
- Fatigue
- Insomnia
- A negative spillover into personal relationships or home life
- Depression
- Anxiety
- Alcohol or substance abuse
- Heart disease
- High cholesterol
- Type 2 diabetes, especially in women
- Stroke
- Obesity
- Vulnerability to illnesses
Manage and Prevent*

- **Manage the stressors that contribute to job burnout.** Once you've identified what's fueling your feelings of job burnout, you can make a plan to address the issues.
- **Evaluate your options.** Discuss specific concerns with your supervisor. Perhaps you can work together to change expectations or reach compromises or solutions. Is job sharing an option? What about telecommuting or flexing your time? Would it help to establish a mentoring relationship? What are the options for continuing education or professional development?
- **Adjust your attitude.** If you've become cynical at work, consider ways to improve your outlook. Rediscover enjoyable aspects of your work. Recognize co-workers for valuable contributions or a job well-done. Take short breaks throughout the day. Spend time away from work doing things you enjoy.
- **Seek support.** Whether you reach out to co-workers, friends or loved ones, support and collaboration might help you cope with job stress and feelings of burnout. If you have access to an employee assistance program (EAP), take advantage of the available services.
- **Assess your interests, skills and passions.** An honest assessment can help you decide whether you should consider an alternative job, such as one that's less demanding or one that better matches your interests or core values.
- **Get some exercise.** Regular physical activity can help you to better deal with stress. It can also help you get your mind off work and focus on something else.
- **Get some sleep.** Sleep restores well-being and helps protect your health. Aim for at least 7-8 hours each night

Stress, Care-givers, Burnout

- Healthy diet
- Sleep
- Exercise
- Mental stimulation
- Active social life
- Stress management

Burnout prevention
Practices

Physical
- Yoga, tai chi, running, etc

Spiritual
- TM, Qigong, prayer,

Meditation
- Concentrative – Mantra, prayers, visualization, qigong, yoga
- Receptive/awareness – Vipassana, mindfulness
- Reflective/analytical – disciplined thinking for insight
- Expressive – dancing, chanting, whirling, fast breathing, drumming, calligraphy

Other
- Nature, silence, gratitude, forgiveness
• 12 minutes a day for 8 weeks
  • Relaxation = control group

• Significant improvements in
  • Depression
  • Overall mental health/distress
  • Cognitive function

• Decreased stress-induced cellular aging
Meditation and Caregivers

Change in Telomerase Levels in Meditation and Relaxation Groups

Lavretsky, 2013
Summary

- Validated, longstanding practice
- Non-denominational / trans-theoretical adjunct
- Likely multifactorial direct and indirect impact
  - Risk factors
  - Direct cortical effects
  - Direct functional effects
- Not a cure-all
- Requires effort
- Addresses multiple domains
  - Including quality of life
Future Directions

• Program Export/Validation
  • ADWG/DAC State Plan Implementation
  • PSHVN/Bree Collaborative

• Enhanced partnerships with area resources
  • Frye here:now Program
  • Area Agencies on Aging/DSHS
  • Alzheimer’s Association
  • Intergenerational Program
Thank you for your attention!

Questions?
Resources

- Mindfulness Northwest
  - http://www.mindfulnessnorthwest.com/

- Seattle Mindfulness Center
  - http://seattlemindfulnesscenter.com/

- Mindfulness for Beginners/Full Catastrophe Living (Kabat-Zinn)
References/Resources


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