Mind Body Medicine:
Emerging Science and Economics

Darshan Mehta, MD MPH
Medical Director
Benson-Henry Institute for Mind Body Medicine, MGH

Associate Director of Education
Osher Center for Integrative Medicine, BWH
Instructor in Medicine, Harvard Medical School
dmehta@partners.org
“This job has cost me my health, my family, and my soul. Can I get a receipt?”
What I Hope to Cover

- Definitions
- Emerging Research
- Clinical Applications
35 y/o M with no significant PMH who presents for a routine physical examination

 FH: Father died of lymphoma; Mother with long-standing HTN

 SH: Recently married. Works in IT industry, requiring significant amount of travel. Denies tobacco, alcohol, or illicit drug use. Due to travel, he tends to eat a lot of fast food.
Physical exam: BMI – 31; BP – 135/90; otherwise, no remarkable findings

Labs: HDL – 41; LDL – 148; TG – 150; FPG - 120

Assessment: Hypertension; ?Metabolic syndrome

Plan: Patient is adamant that he does not want medication. In addition, to diet and exercise counseling, he wants to share with you something that he read:
THE SCIENCE OF MEDITATION

New Age mumbo jumbo?
Not for millions of Americans who meditate for health and well-being. Here’s how it works.
Adapted from Earnshaw & Cooper 96
Effects of Stress on Performance

The diagram illustrates the relationship between stress and performance. It shows that performance is highest at a moderate level of stress, with both low and high stress levels leading to decreased performance.
Between 60-90% of healthcare visits are related to stress.

J Chronic Dis. 1964 Oct;17:959-70
Mind Body Medicine

The Spoken Body

Eastern Journeys

Power of Suggestion

Healing Networks

Stress in the Modern Life

Power of Positive Thinking
Stress in the Modern Life
Hard-charging businessman Billy Sloan is about to learn that continued stress does inhibit one’s memory.
Emergence of “Stress” in Modern Life

- Neurasthenia
  - President Theodore Roosevelt and the Wilderness
- Fight or Flight Response
  - Walter B. Cannon (1871-1945)
  - Increase of blood sugar
  - Secretion of adrenaline
  - Dilation of pupils
  - Piloerection

The Evolutionary Advantage and Disadvantage
Psychology of Stress

Stress
- Process in which environmental demands tax or exceed the adaptive capacity of an organism
- May result in psychological and/or biological changes that may place persons at risk for disease

Stressors
- Environmental experiences

Appraisal
- Subjective evaluations of the stressfulness of the situations

Stress Response
- Affective, behavioral, or biological responses to stressors or appraisals

Adapted from Lazarus and Folkman
Laboratory Examinations

- Type A personality and the link to coronary artery disease
- Stress and the link to the immune system
- Cumulative effects of stress over the course of a lifetime
The Three Types of Allostatic Load

1. Normal
   - Stress
   - Activity
   - Recovery
   - Allostatic load
   - Repeated “hits”
   - Lack of adaptation
   - Prolonged response
   - Inadequate response
Power of Suggestion
Pain Ratings by Voltage Intensity

![Graph showing pain ratings by voltage intensity](image)

<table>
<thead>
<tr>
<th>Shock Intensity, V</th>
<th>Placebo price</th>
<th>Regular</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>35</td>
<td>30</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>20</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>0</td>
<td>-5</td>
</tr>
</tbody>
</table>

No.

<table>
<thead>
<tr>
<th>Regular price</th>
<th>41</th>
<th>41</th>
<th>40</th>
<th>37</th>
<th>31</th>
<th>27</th>
<th>23</th>
<th>21</th>
<th>20</th>
<th>18</th>
<th>14</th>
<th>12</th>
<th>9</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low price</td>
<td>41</td>
<td>41</td>
<td>40</td>
<td>38</td>
<td>31</td>
<td>29</td>
<td>27</td>
<td>24</td>
<td>19</td>
<td>17</td>
<td>11</td>
<td>7</td>
<td>5</td>
<td>4</td>
</tr>
</tbody>
</table>
Mindful Practice

- To become more aware of one's own mental processes, listen more attentively, become flexible, and recognize bias and judgments, and thereby act with principles and compassion
- To have an ability to observe the observed while observing the observer in the consulting room
- Mindful practice requires mentoring and guidance

Epstein RM. Mindful Practice. JAMA. 1999; 282: 833-839
Components of placebo effect: randomised controlled trial in patients with irritable bowel syndrome


BMJ published online 3 Apr 2008; doi:10.1136/bmj.39524.439618.25
"I want you to take this placebo two times a day for ten days. If your condition doesn't improve, I'll give you a stronger one."
**Global improvement**

Test of trend: $P<0.001$; 95% CI 0.18 to 0.90 for limited v waiting list; 0.32 to 1.11 for augmented v limited

**Adequate relief**

Test of trend: $P<0.001$; 95% CI 2.7 to 30.7 for limited v waiting list; 3.2 to 32.3 for augmented v limited

**Symptom severity**

Test of trends: $P<0.001$; 95% CI -7.9 to 31.2 for limited v waiting list; 16.2 to 63.2 for augmented v limited

**Quality of life**

Test of trends: $P<0.001$; 95% CI -2.1 to 3.2 for limited v waiting list; 1.7 to 8.8 for augmented v limited
Susie, I thought you were sick. You look great!

I feel great!

I took some organic Kombucha algae honey spore tincture - cleared me right up!

Try it!

What? That stuff doesn't work! No studies have shown any magical thinking in no way impacts health - it's junk science!

You're ruining my placebo effect!

Ignorance is bliss, huh?

It's my health care plan.
Moving toward the East

✧ Counterculture movement of the 1960s and 1970s
  ✧ The Beatles

✧ Asian spiritual practices
  ✧ Paramahansa Yogananda
  ✧ Thich Nhat Hahn
  ✧ J. Krishnamurti

✧ Non-Asian Mystical practices
  ✧ Centering Prayer
  ✧ Kaballah
  ✧ Sufism
Maharishi Mahesh Yogi

- Moving from Woodstock and Beatles to science and physiology
- Discovery of the fourth major state of consciousness
The Bill Moyers Effect
Clinical program developed by Jon Kabat-Zinn, PhD at University of Massachusetts

Origins are in Buddhist meditation (Vipassana)

Characterized by a psychological state of intentional non-judgmental present moment awareness
Emergence of Neuroscience Research
“I’m learning how to relax, doctor - but I want to relax better and faster! I want to be on the cutting edge of relaxation!”
Mind/Body Medicine Equation

Stress (Allostatic Load) ÷ Social Support & Resiliency Factors = Selective Vulnerability: Propensity to Illness
Prevalence of Mind Body Medicine

10 Most Common CAM Therapies Among Adults - 2007

Therapies with significant increases between 2002 and 2007 are:

- Deep breathing: 11.6% to 12.7%
- Meditation: 7.6% to 9.1%
- Massage: 5.0% to 8.3%
- Yoga: 5.1% to 6.1%

Treating Patients with Mind Body Medicine

• Reduces frequency of medical symptoms
  – e.g., pain, fatigue, and gastrointestinal symptoms

• Decreases severity of psychiatric symptoms
  – e.g., anxiety, interpersonal sensitivity and depression

• Increases health-promoting lifestyles
  – e.g., spiritual growth, health responsibility and stress management

Samuelson et al., 2010
BHI Cardiac Wellness

- Reduces Costs (by $3000 compared to standard CR)
- Increases Time to Re-hospitalization
- Decreases Mortality at 3 Years

“Evaluation of Lifestyle Modification and Cardiac Rehabilitation in Medicare Beneficiaries” CMS Demonstration Project, 2009
Described by Dr. Herbert Benson in mid-1970s

Conditions by which it is evoked
- The repetition of a word, sound, prayer, thought, phrase or muscular activity
- The passive return to the repetition when other thoughts intrude

Breaks the train of everyday thought

Benefits seen when performed 15-20 minutes 1-2x/day
Eliciting the Relaxation Response Quiets the Mind
Eliciting the Relaxation Response Activates Specific Brain Areas

Amygdala

Hippocampus

6mm

24mm
Eliciting the Relaxation Response Increases Cortical Thickness

The right BA 9/10 superior frontal and middle gyri and sulci and right anterior insula are significantly thicker in meditators versus age, gender and education matched controls.
What Neuroscience has Revealed

Eliciting the Relaxation Response Changes Gene Expression

Eliciting the Relaxation Response Impacts...

...Apoptosis

...Stress Response

...Inflammation

Mind Body Practice and Functional Genomics

- Enhanced expression of genes associated with
  - energy metabolism and mitochondrial function
  - insulin secretion
  - telomere maintenance

- Reduced expression of genes linked to
  - inflammatory response
  - stress-related pathways

- Potential mechanisms for positive health effects

Bhasin MK et al. 2013. PLoS ONE 8:e62817
Niles H et al. Ochsner J. 2014. 14:681-95
Decreased Pain Catastrophizing

*p<.05
**p<.01
Decreased Pain Trait Anxiety

Trait Anxiety Inventory (STAI-Y) Scores

*Kuo B et al. PLOS ONE. 2015.*

*p<.05

**p<.01
Improve QoL on the IBD-Q

Kuo B et al. PLOS ONE. 2015.

*p<.05  
**p<.01
Genes Implicated in IBD Inflammatory Processes are Downregulated

- **Interferon regulation and signaling genes**
  - Cortactin (CTTN)—required for endothelial barrier functions, vascular permeability, neutrophil recruitment, and leukocyte adhesion and extravasation during inflammation
  - GTPase RAB11A—involved in key events in the innate immune response and host defenses against bacterial infection

- **Endoplasmic reticulum stress markers**
  - EDEM1 and EDEM3—downregulated by SMART-3RP, but typically upregulated in actively inflamed IBD

Kuo B et al. PLOS ONE. 2015.
Network Analysis Reveals NF-κB as a Key Focus Hub in IBD

Kuo B et al. PLOS ONE. 2015.
Gene Sets Related to Cell Cycle and the Immune System Are Downregulated

- Significantly altered pathways
  - cell cycle (e.g., mitotic cell cycle, G1 phase, G2 phase, G1-G2-M phase, P53 signaling)
  - apoptosis (e.g., apoptosis, BAD pathway)
  - immune system (e.g., TLR, IFN, TNFR1, PPARA, P38MAPK, IL1R pathways)
  - extracellular matrix related pathways (e.g., TGFB and BMP)

- Multiple cell cycle and apoptosis-related molecules (MAPK1, CCND1, MAP2K1, MAPK8) in leading edge analysis (below) are downregulated

Kuo B et al. PLOS ONE. 2015.
A New Paradigm

Overall Health

Pharmaceuticals
Surgery
Self-care
Fig 1. Sample selection.

Research Patient Data Registry (RPDR) → > 2 million covered lives

Demographically Matched Set

Propensity Score Matched Set

High Utilization Propensity Score Matched Subset

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>4452</td>
<td>13149</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>1542</td>
<td>3446</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>1196</td>
<td>222</td>
</tr>
</tbody>
</table>


http://journals.plos.org/plosone/article?id=info:doi/10.1371/journal.pone.0140212
Fig 2. Utilization by Functional class: high utilizing controls vs. propensity score, initial utilization rate matched intervention group.


http://journals.plos.org/plosone/article?id=info:doi/10.1371/journal.pone.0140212
43% reduction in billable encounters for intervention patients across all functional categories

Amongst high utilizers, in conservative propensity analyses, there was average relative utilization reduction of:
- 18.3% in functional categories
- 24.7% reduction across clinical site categories

Clinical encounters were 21.4% lower in the intervention group compared to controls post intervention

The cost savings from reduced emergency room visits alone in the treatment group relative to the control group, is on the order of $2360/patient/year.

Expected range of cost savings of $640 - $25,500/patient/year
“Nothing happens next. This is it.”
What is Mind Body Medicine

- Healthcare provider-led rituals
- Healing Power of the Examined Life
- Patient-initiated practices and self-empowerment
- Scientific examination of mind-body connection
- Social Network
- Exotic examinations of medical and moral redemption
- The blurring of boundaries between the religious and secular worlds
Building Resilience

- Relaxation Response
- Minis
- Mindfulness
- Cognitive Beliefs
- Sleep
- Diet
- Exercise
- Humor
- Social Support
Meditation is too hard. How do you keep one thought in your mind for this long?

Dinner dinner dinner dinner...
Benson-Henry Institute for Mind Body Medicine at Massachusetts General Hospital

- Independent thematic center at MGH
- Clinical practice, research and education
- Study ways to combat stress and enhance resiliency
- Focus on mind body practices in the healthcare system:
  - Meditation
  - Yoga
  - Tai chi
Stress Management and Resiliency Training Program

Resiliency can be built through a three-tiered process

- ongoing practice of techniques which elicit the relaxation response (e.g., meditation, yoga)
- building awareness of stress and its negative effects
- promoting social connectedness and healthy lifestyle behaviors

- 8-week multimodal program which incorporates elements of modern psychotherapy with wisdom traditions through mind body practices
SMART Certification for Healthcare Practitioners

- Rigorous training in the SMART model
- Ability to offer SMART to patients
- Provides an off-the-shelf curriculum for clinical delivery
- Opportunity to partner with BHI Research Team
- Listing as a BHI-certified provider
1. Continuing Medical Education (CME):
   • Attend the BHI/Harvard CME course within past three years
     OR
   • View all three online BHI/MGH Psychiatry Academy CME courses in Mind Body Medicine within the past three years

2. SMART Program
   Experience an 8-session SMART program as a participant, either in-person at BHI or via video conference.

3. SMART Implementation Training
   Participate in a 2-day SMART Implementation Training (in-person or via video conference)

4. Competency Exam
   Demonstrate core knowledge on a competency exam.**

5. Mentorship
   Candidates will be mentored during delivery of their first SMART program as a group leader
Many Hurdles Left to Clear

- Funding the science that needs to be done
- Proving clinical efficacy in specific conditions
- Determining specific biological mechanisms
- Demonstrating cost effectiveness
- Overcoming bias, convincing skeptics
- Creating culture change within medicine
- Broadening acceptability and accessibility in the community
- Using evidence to convince payers and governments to cover these interventions
THANK YOU!!