Managing Stress in MS using Biofeedback and Mindfulness

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Goals:

• Define stress and acquire understanding of the difference between stress and other psychological states (i.e., depression and anxiety)

• Discuss relationships between stress and the multiple sclerosis (MS) disease process

• Review stress-management interventions conducted for persons with MS – including biofeedback and mindfulness
Confession-

• In past year have you had:
• A) Little amount of stress
• B) Moderate amount of stress
• C) High amount of stress

Social Psych Experiment

• Suppose you are asked to give a presentation in front of a large audience on a topic that you are somewhat familiar with, but not an expert. There are lights, there is a camera and there is a panel of experts in the topic.

The expert panelist are giving your negative non-verbal cues throughout the presentation

You feel your body begin to tense up, perhaps sweat droplets on your forehead, your heart racing, your stomach drop

• You are asked to step off the stage because….
Emotional Reactivity

Recall the best day of your life thus far, remember everything you can about it. How you felt, what you were wearing, any vivid images, the scent of the room, what you heard, really bring about the emotion.

Can do the same with the worst day of your life.

Cognitions play a part in controlling our emotions

- Irrational Beliefs:
  - I should
  - I’m stupid
  - I am worthless
Performance Anxiety

- Count backwards from 876 by 7s
- Performance anxiety

Yerkes-Dodson Law on Performance
Conceptualizing Stress

- There is no uniform definition for the term “stress”
- Early research by Cannon (1932) and Selye (1950, 1956) defined stress as a biological response
- More recent conceptualizations view stress as an interaction between the individual and environment (Lazarus & Folkman, 1984)
- Current literature focuses on the interaction between biological responses to stress, social factors and coping (Sapolsky, 2004)

Acute versus Chronic Stress

<table>
<thead>
<tr>
<th>Acute</th>
<th>Chronic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time-limited, confronting a short-term challenge</td>
<td>Pervade a person’s life, forcing him/her to restructure identity or social roles</td>
</tr>
<tr>
<td>May not know when challenge will subside, but have a clear sense that it will end at some point in the future</td>
<td>Do not know whether or when the challenge will end/can’t be certain that it will ever end</td>
</tr>
<tr>
<td>Examples: Rushing to meet a deadline, car accident that leads to a fender bender</td>
<td>Examples: Suffering a traumatic injury that leads to physical disability, providing care for a spouse with severe dementia</td>
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</tbody>
</table>
Conceptualizing Stress

• Cannon: Fight-or-flight response
ANS → SNS

• The ANS affects:
  – Heart rate, digestion, respiratory rate, salivation, perspiration, pupillary dilation, urination and sexual arousal.

• Whereas most of its actions are involuntary, some, such as breathing, work in tandem with the conscious mind.

• ANS branches into the PNS and SNS

SNS: Fight or Flight

Stress Arouses SNS

Activation of NT and Hormones

+ BP, HR, Resp, Mscl Tns, in immuno resp, brain fnx

Results in: anxiety, nervousness, depression, Cognitive decline, chronic stress, pain, Chronic health conditions
Behavioral Medicine in a Multiple Sclerosis Population

Neural circuit activated: Limbic sx & Pre-frontal cortex

Arousal of PNS
Release of oxytocin & vasopressin

+secretion of Immunoglobulin A & natural killer cells
Systolic and diastolic BP decrease
Feeling hopeful, Optimistic
Renewal/Refreshed

PNS: Engaging Renewal/ Recovery
Rest and Relax

Rest and Relax → Fight or Flight

Parasympathetic
Sympathetic

Stimulates flow of saliva
Slows heartbeat
Constricts bronchi
Stimulates parasympathetics and secretion
Stimulates release of bile
Contracts bladder

Ganglion
Medulla oblongata

Vagus nerve
Sympathetic chain

Systolic plexus
Inhibits flow of saliva
Accelerates heartbeat
Inhibits pupils
Stimulates perspiration
Inhibits flow of sweat
Conversion of glycogen to glucose
Secretion of adrenaline and noradrenaline
Inhibits bladder contraction
Cardiac effect of stress

MS: Effects of Stress
Stress and the Immune System

• Central sympathetic outflow downregulates lymphoid immune activity (Felten & Felten, 1994)
• Hypothalamic-pituitary-adrenal (HPA) axis secretes adrenal hormones such as epinephrine, norepinephrine, and cortisol which suppresses the immune system
• Immune suppression is also caused by lack of parasympathetic activity (Pavlov et al., 2009)
• Efforts to manage stress may lead to maladaptive behaviors which modify immune processes (Kiecolt-Glaser & Glaser, 1998)

Stress and the MS Disease Process

• Many patients with MS report a relationship between stress and exacerbation of their disease (Simmons, 2010)
• Stress can cause inflammation which may lead to demyelination and impaired nerve conductance (Artemiadis et al., 2011, Harvey et al., 2006, Heesem et al., 2007, Smith & McDonald, 1999)
• Stressful life events have been shown to precede new gadolinium-enhancing (Gd+) MRI brain lesions by approximately 4-8 weeks (Mohr et al., 2000)
Acute Stress versus Chronic Stress and the MS Disease Process

• Chronic stressors appear to be more toxic than acute stressors in MS (Ackerman et al., 2002, Mitsonis et al., 2008, Philippopoulos et al., 1958, Sibley, 1997)

• Chronic stress reduces glucocorticoid receptors on immune cells. This results in less ability to downregulate the immune system which causes inflammation (Mohr & Pelletier, 2006)

Temporal Model of Stress and Exacerbation

• Mohr & Pelletier, 2006
Observational Studies Linking Stress and MS

• Golan et al. 2008 “Impact of Exposure to War Stress on Exacerbations of Multiple Sclerosis”

• Assessed the impact of the 2006 war between Hezbollah and Israel on MS exacerbations
• Study took place July-August 2006
• Participants were 156 patients with RR MS
• Compared the number of relapses during and after the war with similar time periods at the preceding year

Observational Studies Linking Stress and MS

• Golan et al. 2008 “Impact of Exposure to War Stress on Exacerbations of Multiple Sclerosis”

• Results:
  — Perceived stress
    — Patients who were more distressed during the war had more relapses
  — Relapses
    — During the 33 days of the war, there were 18 relapses among the 156 patients, compared with 1 to 6 relapses in similar time periods over the 12 months before the war
Observational Studies Linking Stress and MS

• Yamout et al. 2010, “The effect of war stress on multiple sclerosis exacerbations and radiological disease activity”

• Examined relationship between exposure to war-related events during July 2006 Israeli-Lebanese war and clinical relapses and MRI disease activity

• 216 Lebanese patients with RR MS

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Observational Studies Linking Stress and MS

• Yamout et al. 2010, “The effect of war stress on multiple sclerosis exacerbations and radiological disease activity”

• Results:
  – Relapses:
    – Number of relapses during war period was significantly greater than number of relapses during the non-war period
    – Of the patients with MRI data during the war: clinical relapses were associated with increased Gd+ lesions
Stress-Management Intervention Studies and MS

<table>
<thead>
<tr>
<th>Author, Year</th>
<th>Class</th>
<th>MS</th>
<th>Outpatient vs. Inpatient</th>
<th>Intervention</th>
<th>Outcome Measure</th>
<th>R</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mohr et al. 2012</td>
<td>I</td>
<td>RR</td>
<td>Outpatient</td>
<td>SMT-MS</td>
<td>Gd+ lesions</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Artemiadis et al. 2012</td>
<td>III</td>
<td>RR</td>
<td>Outpatient</td>
<td>RB-PMR</td>
<td>LES</td>
<td></td>
<td>Y N</td>
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<tr>
<td>Hughes et al. 2008</td>
<td>III</td>
<td>U</td>
<td>Outpatient</td>
<td>Stress self-management</td>
<td>PSS</td>
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<td>Y N</td>
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<tr>
<td>Foley et al. 1987</td>
<td>III</td>
<td>U</td>
<td>Outpatient</td>
<td>SIT</td>
<td>BDI</td>
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<td>Y N</td>
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<tr>
<td>Ghaziani et al. 2009</td>
<td>III</td>
<td>U</td>
<td>Outpatient</td>
<td>PMR</td>
<td>SF-8</td>
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<td>N N</td>
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<tr>
<td>Crawford &amp; Matzur 1987</td>
<td>III</td>
<td>U</td>
<td>Inpatient</td>
<td>Relaxation, cognitive and behavioral strategies</td>
<td>POMS</td>
<td></td>
<td>N N</td>
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<tr>
<td>Pritchard et al. 2010</td>
<td>IV</td>
<td>U</td>
<td>Outpatient</td>
<td>Yoga Nidra</td>
<td>PSS</td>
<td></td>
<td>N N</td>
</tr>
<tr>
<td>Welch 1987</td>
<td>IV</td>
<td>U</td>
<td>Outpatient</td>
<td>Relaxation, cognitive and behavioral strategies, modeling and covert rehearsal</td>
<td>Self-reported stress level on 1-7 scale</td>
<td></td>
<td>N N</td>
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</tbody>
</table>

**Stress-Management Intervention Studies and MS**

- Mohr et al. 2012 “A randomized trial of stress management for the prevention of new brain lesions in MS”
Characteristics of Stress-Management Studies

• Majority are uncontrolled, non-randomized with subjective outcome measures

• Study conducted by Mohr et al. (2012) was the only study that utilized a biological outcome measure as an endpoint

Characteristics of Stress-Management Studies

• Cognitive-behavioral techniques were most frequently used

• Majority include some form of relaxation training

• Most common relaxation techniques were abdominal breathing and progressive muscle relaxation

• While many of the stress-management therapies employed in the included studies are similar, there were not two studies that utilized the exact same intervention
Mitsonis et al. 2010

Mitsonis et al. (2010) The effects of escitalopram on stress-related relapses in women with multiple sclerosis: an open-label, randomized, controlled, one-year follow-up study

- Forty-eight female patients with RR MS randomly assigned to receive escitalopram 10 mg/day or continue treatment as usual

- Results:
  - Cumulative risk for relapse was 2.9 times higher for controls than for escitalopram treated patients
  - Escitalopram was generally well-tolerated
So what does this mean in the real world?

- Integrating Behavioral and Physical Health Care
- Within the past 20 years, the Institute of Medicine (IOM) declared that primary care and behavioral health were inseparable (1)
- Evidence from RCT demonstrate that integrated care improves the process of care and clinical outcomes (including quality of life) for patients with common medical and behavioral conditions (depression, MS, cardiac, anxiety). (2-5)

- Donaldson MF, Yordy KG, Lohr KN, Vanselow NA, eds. Primary Care: America's heal in a new era. Washington, DC.

What Does Integrative Care Look Like?

- Physical Activity/Exercise
- Nutrition/Weight Control
- Sleep Hygiene
- Spirituality
- Healthy Relationships/ Partner, Family, Friends
- Purpose/meaning
- Emotional and Physical Health
- Recreation
- Intimacy

Cleveland Clinic
• Goal in psychology is to help mediate the activated SNS by:
  – understanding the mind/body connection,
  – identifying distorted thoughts and associated emotions
  – teaching skills to shut down the fight or flight response
  – ** we know that changing your mind about stress can change your bodies physiological response to stress.

MS & Stress- Management: Biofeedback and Mindfulness
Biofeedback

MS & Stress-Management: Biofeedback and Mindfulness

• Biofeedback is another method of learning how to manage stress.
• During biofeedback, a series of sensors are connected to your body.
• The sensors detect changes in physical functions, such as muscle tension, blood pressure, heart rate
  or skin temperature, and provide immediate feedback through a tone or display on a computer
  screen.

Biofeedback helps you recognize
  that your body is tense,
  identify what you are doing to make it tense,
  learn how to reduce the tension,
  and practice releasing the tension through effective physical skills.

Biofeedback usually requires several sessions with a skilled biofeedback therapist.
Biofeedback

• A way to teach people to regulate their own bodies
• Restoring a good balance of SNS and PNS
<table>
<thead>
<tr>
<th>COMMON BIOFEEDBACK MEASURES</th>
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<tbody>
<tr>
<td>EMG</td>
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<tr>
<td>EEG</td>
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<tr>
<td>DPT</td>
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<tr>
<td>SCL</td>
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<tr>
<td>HR</td>
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<td>HRV</td>
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</table>

Respiratory Rate

Biofeedback Training
Multiple Sclerosis – Why BF?
• Help manage symptoms with stress management, increased self-efficacy
• Improve quality of life

Multiple Sclerosis – Why BF?
• Restore autonomic balance?
• Reduce inflammatory state?
MS & Stress-Management: Biofeedback and Mindfulness

• “Biofeedback Training in Patients with Multiple Sclerosis,” PI: Christine Moravec, Ph.D.

• “Effects of group therapy on stress in a Multiple Sclerosis population,” Josh Wilt, M.A., recently submitted grant proposal

Biofeedback Training in Patients with Multiple Sclerosis

• Aims of the study:

• To measure the effects of biofeedback-assisted stress management (BFSM) on:
  – autonomic nervous system activity
  – inflammatory markers
  – symptoms, disease-specific markers, and quality of life
Biofeedback Training in Patients with Multiple Sclerosis

• Study Design

• Randomized, controlled trial of BFSM vs. Usual Care

Subjects Enrolled (n = 19)

Initial Study Visit

Randomization

Treatment Group (n=10)

8 Training Sessions

Final Study Visit

Usual Care Group (n=9)

Final Study Visit

Mindfulness
Mindfulness

“Mindfulness means paying attention in a particular way; On purpose, in the present moment, and nonjudgmentally.”

-Jon Kabat-Zinn
Mindfulness: The History

- Rooted in ancient Buddhist meditative discipline
- In Sanskrit = smtri “to remember”
- In Buddhist scripture = sati “mindfulness”
- Over 1600 years ago, St. Augustine said:
  - “Men go forth to marvel at the heights of mountains and the huge waves of the sea, the broad flow of the river, the vastness of the ocean, the orbits of the stars, and yet they neglect to marvel at themselves.”
- Blended into psychology in the 1970s

Mindfulness

A commitment to being:
- Purposeful
- Focused in the present
- Acting nonjudgmentally
Mindfulness: Awareness & Practice

• Mindful Awareness
  – An abiding presence of awareness
  – Freedom of the mind

• Mindful Practice
  • All encompassing practice of intentionally attending to an open and caring way

• Mindful Being
  – Do not allow your thoughts to stray
  – Do one solitary single activity
  – Bring the mind back to the present moment
Mindfulness: In Practice

1. Automatic Pilot
2. Dealing with Barriers
3. Mindfulness of the Breath
4. Staying Present
5. Allowing/ Letting Be
6. Thoughts are Not Facts
7. How I can Best Take Care of Myself
8. Using What Has Been Learned
Research on the Efficacy of Mindfulness

- Number of published studies that show some significant
- There are studies on mindfulness in the treatment of:
  - Stress
  - Anxiety
  - Depression - study by Teasdale found that it reduced depressive episodes by 50%
  - Eating Disorders
  - Addiction
  - Pain
  - Chronic Disease Management

Future Research: What Do We Need?

- Results from studies conducted to date appear promising as most studies demonstrate improvements in patient-reported outcome measures
- Few with MS patients
- Large, prospective, multicenter trials will help to further define the role of mindfulness interventions in the treatment and course of MS
What Can We Tell Our Patients To Help Them Manage Stress?

• Take care of your overall health
  – Well-balanced meals
  – Exercise
  – Sleep
  – Take medications as prescribed
  – Use alcohol and caffeine in moderation

• Social support
  – Keep up with friends, community activities

• Learn to relax, using strategies learned in biofeedback

• Teach mindfulness strategies

• Refer to behavioral health to learn helpful coping skills, treat common co-morbidities such as depression and anxiety

Conceptualizing Stress

• Sapolsky (2008):
  • Stress Response: Savior to Killer

   *WHY ZEBRAS DONT GET ULCERS*