PILOT STUDY: PSYCHOLOGICAL AND COGNITIVE BENEFITS OF YOGA & MINDFULNESS MEDITATION FOR BRAIN INJURY SURVIVORS

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Kim Baker, Director of Yoga Program, LYB

BIA MA Conference March 2016
This is your brain

This is your brain on yoga
Kevin Pearce suffered a near fatal TBI while training for the 2010 winter Olympics.

Brothers Kevin and Adam established the LoveYourBrain Foundation in 2014.

The HBO documentary, “The Crash Reel,” has been a powerful platform for raising awareness about TBI.
The LoveYourBrain Foundation is a social-profit that aims to improve the quality of life of people affected by TBI.

Our message—LoveYourBrain—embodies our positive approach to brain injury prevention, recovery, and health.
The LYB Yoga Program supports TBI survivors and their caregivers to participate in affordable yoga and meditation classes tailored to their specific needs.
Yoga: a practice involving physical movement, breathing exercises, and meditation techniques

- Slow deep breaths. Settle into the present.
- Circle the body around the seat. Both directions.
- Inhale arms up.
- Side stretch.
- Inhale arms up.
- Side stretch.
MINDFULNESS MEDITATION: paying attention in the present moment, on purpose, without judgment
We offer yoga teacher trainings and partner with select yoga studios and wellness centers across the US to offer our program.
WHY
COMMON
COSTLY
WHOLE PERSON CHALLENGES
ISOLATION
ENTIRE FAMILY
UNPRECEDENTED IN TBI
ACCESSIBLE
AFFORDABLE
INTEGRATED
COMMUNITY-DRIVEN
EMPOWERING
BEST PRACTICES
**RESILIENCE VERSUS RECOVERY**

**re·cov·er·y**
reˈkəvər(ə)rē/
*noun*
1. a return to a normal state of health, mind, or strength.
2. the action or process of regaining possession or control of something stolen or lost.

**re·sil·ience**
reˈzilyəns/
*noun*
1. the ability of a substance or object to spring back into shape; elasticity.
Realistic optimism
Facing fears
Social support
Religion and spirituality
Accepts what cannot change
Physical and brain fitness
Cognitive and emotional flexibility
Meaning and purpose

safe movement can inspire physical strength, a sense of purpose, and realistic optimism.

mindfulness can create a more positive, flexible, and accepting landscape of the mind.

a stronger connection to themselves, people in their lives, and a broader social network.

Our goal is to provide all traumatic brain injury survivors and caregivers with the opportunity to improve and restore their physical and emotional wellbeing through yoga and meditation.
NEUROPLASTICITY

• Jugglers’ learning-induced neuroplasticity using MRI
• Structural changes in areas associated with processing and storage of visual motion

• Cross-sectional study of 20 meditators, 15 matched controls
• Meditated av. 40 mins/day, 9 +/- 7 years experience
• MRI showed greater thickness in prefrontal cortex and insula in meditators than controls
• 16 participants in 8-week MBSR program, 17 in control group
• Weekly group instructions and at home guided meditation practice (av. 27 minutes/day)
• MRI of brain structures of 2 weeks pre- and post-MBSR

• Increased density of hippocampus, pre-frontal cortex, cerebellum, temporal-parietal juncture

<table>
<thead>
<tr>
<th>Symptoms/sequelae of TBI</th>
<th>Meditation and Yoga</th>
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<tbody>
<tr>
<td>Poor concentration, disinhibition</td>
<td>Increases thickness of prefrontal cortex</td>
</tr>
<tr>
<td>Emotional dysregulation</td>
<td>Increases medial prefrontal cortex and decreases amygdala density</td>
</tr>
<tr>
<td>Limited self-awareness and empathy</td>
<td>Increases thickness of the insula</td>
</tr>
<tr>
<td>Poor memory</td>
<td>Increase density of hippocampus</td>
</tr>
<tr>
<td>Denial, negative thought patterns</td>
<td>Cultivates gratitude, optimism, mental flexibility</td>
</tr>
<tr>
<td>Stress</td>
<td>Shift to parasympathetic nervous system</td>
</tr>
<tr>
<td>Balance, weakness, inflexible</td>
<td>Increase balance, strength, ROM, flexibility</td>
</tr>
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</table>
WHAT’S BEEN DONE?
Complementary and Alternative Medicine Use among U.S. Adults with Common Neurological Conditions

Rebecca Erwin Wells, MD, MPH
Division for Research and Education in Complementary and Integrative Medical Therapies, Harvard Medical School; Department of Neurology, Beth Israel Deaconess Medical Center, Boston, MA. E-mail address: RebeccaErwinWells@bidmc.harvard.edu

- 2007 National Health Interview Survey of >23K US adults
- Adults with common neurological conditions (regular headaches, migraines, back pain with sciatica, strokes, dementia, seizures, or memory loss) used CAM more frequently than those without (44.1% vs. 32.6%, p<0.0001)
Research

Respiratory, Physical, and Psychological Benefits of Breath-Focused Yoga for Adults with Severe Traumatic Brain Injury (TBI): A Brief Pilot Study Report

Colin Silverthorne, PhD, Sat Bir S. Khalsa, PhD, Robin Gueth, E-RYT 500, Nicole DeAvilla, E-RYT 500, Janie Pansini, RN, MS, CS, PNP

1. Professor of Psychology, University of San Francisco

- 10 adults with severe TBI attended weekly chair yoga classes with a focus on pranayama and chanting
- 4 individuals in control group
• Outcomes: respiratory functioning (exhale strength, breath rate) and self-reported physical and psychological well-being
• Baseline, 3, 6, and 9 months
• Yoga group experienced improvements in a greater number of physical measures than the control group
• Both groups reported improvements in well-being
• Limitations: small sample, no primary outcome

Mindfulness-based stress reduction (MBSR) improves long-term mental fatigue after stroke or traumatic brain injury

- Randomized trial with 18 stroke and 11 TBI survivors
- 8-week MBSR group (n=15) or waitlist control group (n=14)
- Significant improvements in self-reported mental fatigue and neuropsychological tests (Digit Symbol-Coding, Trail Making Test)
Feasibility and results of a case study of yoga to improve physical functioning in people with chronic traumatic brain injury

Arlene A. Schmid¹, Kristine K. Miller²,³, Marieke Van Puymbroeck⁴, and Nancy Schalk⁵

• A mixed-methods case study of 3 people with TBI
• 8-week one-on-one yoga program, 2 classes/week
• 1 hr class, 10 min supine guided meditation and progressive muscle relaxation
Outcomes: balance (Berg), balance confidence (ABC), pain (PEG), ROM, strength and mobility

All participants improved:
- balance by 36%
- balance confidence by 39%
- lower extremity strength by 100%

Limitations: small sample

“I mean it’s rocked my world. It’s changed my life. I mean all the different aspects. I mean physically, emotionally, mentally, it’s given me you know my life back...”
What is the impact of a gentle yoga pilot program on the quality of life and executive functioning of adults with ABI?

- Pre-post study with yoga and control groups
- 8-week program in 2014 at a wellness center in rural, NH
- Inclusion criteria:
  - 18 years old
  - Perceived themselves as able to participate in gentle physical movement
  - Able to read, write, and speak English
  - History of ABI
- Group allocation based on schedule availability
YOGA INTERVENTION

• 2 classes/week
• 4 teachers trained to adapt yoga for brain injury
• Emphasis on simple, slow, and repeated sequences
• Integrated class themes (e.g., positive thinking, resilience)
• 10 min mindfulness (e.g., guided meditation, breathing)
DATA COLLECTION

Quality of Life:
• All participants
• Qualtrics online survey pre- and post-intervention
• Demographic characteristics, brain injury history and symptoms, yoga and meditation experience, program satisfaction, and quality of life (Quality of Life after Brain Injury)

Executive Functioning
• Yoga group
• Paper survey of (BRIEF-A) pre- and post-intervention
Quality of Life after Brain Injury (QOLIBRI): Scale Development and Metric Properties

Nicole von Steinbüchel,1 Lindsay Wilson,2 Henning Gibbons,1 Graeme Hawthorne,3 Stefan Höfer,4 Silke Schmidt,5 Monika Bullinger,6 Andrew Maas,7 Edmund Neugebauer,8 Jane Powell,9 Klaus von Wild,10 George Zitnay,11 Wilbert Bakx,12 Anne-Lise Christensen,13 Sanna Koskinen,14 Jaana Sarajuuri,14 Rita Formisano,15 Nadine Sasse,1 Jean-Luc Truelle,16 and the QOLIBRI Task Force

- Adapted to a 3-point Likert scale
**PARTICIPANTS**  TBI (n=25) and other non-traumatic ABI (n=6)

<table>
<thead>
<tr>
<th></th>
<th>Intervention n=16</th>
<th>Control n=15</th>
<th>p-value</th>
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</thead>
<tbody>
<tr>
<td><strong>Age (years) mean (SD)</strong></td>
<td>52.3 (11.4)</td>
<td>44.2 (14.5)</td>
<td>NS</td>
</tr>
<tr>
<td><strong>Sex (% male)</strong></td>
<td>6 (54.6)</td>
<td>5 (45.5)</td>
<td>NS</td>
</tr>
<tr>
<td><strong>Age at the time of brain injury (years) mean</strong></td>
<td>48.7 (11.3)</td>
<td>37.0 (15.2)</td>
<td>0.02</td>
</tr>
<tr>
<td><strong>Age since brain injury (years) mean</strong></td>
<td>3.6 (3.0)</td>
<td>6.9 (10.9)</td>
<td>NS</td>
</tr>
<tr>
<td><strong>Brain injury severity (%)</strong></td>
<td></td>
<td></td>
<td>NS</td>
</tr>
<tr>
<td>Mild</td>
<td>3 (18.8)</td>
<td>4 (28.6)</td>
<td></td>
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<tr>
<td>Moderate</td>
<td>9 (56.3)</td>
<td>4 (28.6)</td>
<td></td>
</tr>
<tr>
<td>Severe</td>
<td>4 (25.0)</td>
<td>6 (40.0)</td>
<td></td>
</tr>
<tr>
<td>Experience with yoga (%)</td>
<td>8 (53.3)</td>
<td>10 (71.4)</td>
<td>NS</td>
</tr>
<tr>
<td>Experience with meditation (%)</td>
<td>8 (53.3)</td>
<td>9 (64.3)</td>
<td>NS</td>
</tr>
<tr>
<td><strong>Balance issues (%)</strong></td>
<td></td>
<td></td>
<td>NS</td>
</tr>
<tr>
<td>Never</td>
<td>4 (28.6)</td>
<td>2 (13.3)</td>
<td></td>
</tr>
<tr>
<td>Occasionally</td>
<td>7 (50.0)</td>
<td>10 (66.7)</td>
<td></td>
</tr>
<tr>
<td>Very frequently</td>
<td>3 (21.4)</td>
<td>3 (20.0)</td>
<td></td>
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<tr>
<td><strong>Fatigue (%)</strong></td>
<td></td>
<td></td>
<td>NS</td>
</tr>
<tr>
<td>Never</td>
<td>2 (13.3)</td>
<td>1 (6.7)</td>
<td></td>
</tr>
<tr>
<td>Occasionally</td>
<td>7 (46.7)</td>
<td>3 (20.0)</td>
<td></td>
</tr>
<tr>
<td>Very frequently</td>
<td>6 (40.0)</td>
<td>11 (73.3)</td>
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<tr>
<td><strong>Seizures (%)</strong></td>
<td></td>
<td></td>
<td>NS</td>
</tr>
<tr>
<td>Never</td>
<td>11 (78.6)</td>
<td>13 (92.9)</td>
<td></td>
</tr>
<tr>
<td>Occasionally</td>
<td>3 (21.4)</td>
<td>1 (7.1)</td>
<td></td>
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<tr>
<td>Very frequently</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td></td>
</tr>
<tr>
<td><strong>Uncontrolled blood pressure (%)</strong></td>
<td>14 (100)</td>
<td>10 (71.4)</td>
<td>NS</td>
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<tr>
<td>Never</td>
<td>0 (0)</td>
<td>3 (21.4)</td>
<td></td>
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<tr>
<td>Occasionally</td>
<td>0 (0)</td>
<td>1 (7.1)</td>
<td></td>
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<tr>
<td>Very frequently</td>
<td>0 (0)</td>
<td>1 (7.1)</td>
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RESULTS

- No significant differences between groups
- Significant improvements in Emotions and Feelings subscales and overall quality of life for yoga group, but not for control

<table>
<thead>
<tr>
<th>QOLIBRI item</th>
<th>Intervention n=12</th>
<th>Control (n=9)</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Pre mean (SD)</td>
<td>Post mean (SD)</td>
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<tr>
<td>Are you satisfied with:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thinking abilities</td>
<td>1.94 (0.32)</td>
<td>2.05 (0.36)</td>
</tr>
<tr>
<td>Emotions and view of yourself</td>
<td>1.69 (0.40)</td>
<td>2.01 (0.52)</td>
</tr>
<tr>
<td>Independence and how you function in daily life</td>
<td>1.96 (0.36)</td>
<td>2.20 (0.55)</td>
</tr>
<tr>
<td>Are you bothered by:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Your feelings</td>
<td>2.10 (0.34)</td>
<td>2.42 (0.39)</td>
</tr>
<tr>
<td>By physical problems</td>
<td>2.02 (0.45)</td>
<td>2.11 (0.44)</td>
</tr>
<tr>
<td>Overall:</td>
<td>1.93 (0.27)</td>
<td>2.15 (0.34)</td>
</tr>
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SATISFACTION

- 75% attendance rate
- 100% would recommend the program to a friend
- Rated 9.2 out of 10

“This program has already made a big difference in how I feel. My mind feels clear and I feel more calm. I am getting more sleep at night and waking up less in the middle of the night.”

“Waking up different muscles and feeling the nerves get activated. Many of which aren’t normally used in my day-to-day movements. Switching it up keeps new sensations to the brain.”
“I appreciate the positive intentions and so many other people in the class. Makes me realize I am not alone in coping with brain injury.”

“I love this class and meeting people with similar stories. I don’t know what I will do without it when is over.”
LIMITATIONS

• Small sample
• Convenience sample
• Adapted the QOLIBRI
IMPLICATIONS

- Positive sense of self and future = resilience
- Resilience $\Rightarrow$ less post-concussive symptoms in TBI[1]
- Feeling less anxious and depressed $\Rightarrow$ TBI survivors’ executive abilities[2] and ability to return to work[3]
- Social engagement in community setting $\Rightarrow$ more sustainable[4], cost-effective[5], and normalizing[6]

Yoga and mindfulness meditation practices have potential to benefit multiple aspects of brain injury survivors’ quality of life and contribute to rehabilitation goals, including a positive sense of self, psychological wellbeing, and community integration.
HOW CAN WE COLLABORATE?
1. Sign up through LYB website

2. Attend the FUNdamentals 6-week series (free)

3. Access “LoveYourBrain friendly” classes ($5)
These questions are about how you feel overall *now* (*including the past week*).

1. **Overall**, how satisfied are you with your physical condition?

2. **Overall**, how satisfied are you with how your brain is working, in terms of your concentration, memory, thinking?

3. **Overall**, how satisfied are you with your feelings and emotions?

4. **Overall**, how satisfied are you with your ability to carry out day to day activities?

5. **Overall**, how satisfied are you with your personal and social life?

6. **Overall**, how satisfied are you with your current situation and future prospects?
THANK YOU!

Together, we believe we can change the culture around traumatic brain injury healing and support through yoga and meditation.