Evaluating Cognitive Changes in Yoga Practitioners with Neuroimaging

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YOGA

The best of Calvin

Bill Watterson
I did it!!!
I did it!!!

Hum...
...I always thought this would be a revealing moment, but...

"The ancient science of Yoga does not belong to India; it is the great contribution of the Indian sages (rishis) to all human kind!... if it is to endure, this must be done in the modern Western scientific way!"

Swami Madhavadas Maharaj (1798-1921)
Yoga teachers should offer the students that which Yoga has to offer, not only what the students ask.

Danilo Forghieri Santaella

Asanas as stretching
✓ Benefits of exercise
Pranayamas as breathing exercises
✓ Benefits of breathing exercises

Asanas as Asanas?
Pranayama as Pranayama?
Meditation as Dhyana?
Effects of Yoga Versus Walking on Mood, Anxiety, and Brain GABA Levels: A Randomized Controlled MRS Study

Chris C. Streeter, MD; Theodore H. Whitfield, ScD; Liz Owen, BA;"; Tasha Rein, BA; Surya K. Keri, MD, MPH; Aleksandra Yakhrizka; MS; Ruth Perret-Ruber; M.A.; Andrew Preissel, PhD; Perry F. Berahaw, MD, PhD; Domenic A. Ciraulo, MD; and J. Eric Jensen, PhD.

FIG. 2. Spectral data showing an increase in the area of the edited γ-aminobutyric acid (GABA) resonance doublet at 3.00 parts per million (ppm) from scan 2 to scan 3 for the left thalamic voxel in the yoga group. Glx, glutamate and glutamine complex; MRS, magnetic resonance spectroscopy; NAA, N-acetylaspartate; MM, macromolecules.

Yoga – What is it?

Brain

Body

Breath

Shrikrishna Bhushan Tengshe, Ph.D.
Yoga - How to practice?

Psychophysical interaction:
➢ Comfort - Stability

Which component is bigger in COMFORT, physical or psychological?

Which one is bigger in STABILITY?

Marcos Rojo Rodrigues, Ph.D.

Cognition

“Mental action, or process of acquiring knowledge and understanding through thought, experience and understanding”

www.oxforddictionaries.com
Aging and Cognition

- Grey matter thickness (Salat et al., 2004)
- Working memory (Draganski et al., 2013)
- DMN connectivity (Mowinckel et al., 2012)
- Salience Network connectivity (He et al., 2014)
- Working memory (DeCarli et al., 2012)
- Hippocampus connectivity (Salami et al., 2014)
- Deactivation of DMN on stimuli (Vidal Piñeiro et al., 2014)

Yoga n=14
Control n=14
Yoga Experience: 10 years
Frequency: 9 h/week
Duration of yoga practice is associated with more GM in the left insula, left frontal operculum, right middle temporal gyrus and left orbitofrontal cortex.
Different percentages of asanas, pranayamas and meditation have different brain effects.

Fluid intelligence and brain functional organization in aging yoga and meditation practitioners

Kripalu Yoga n=16 (13,000h/practice)
Insight Meditation n=16 (7,500h/practice)
Control n=15 (Yoga and Meditation naive)
Fluid intelligence and brain functional organization in aging yoga and meditation practitioners

- Decreased Intelligence loss
- Resting state network preservation
- Greater resistance to damage
Greater Cortical Thickness in Elderly Female Yoga Practitioners—A Cross-Sectional Study

Rui F. Afonso¹, Joana B. Balardin¹, Sara Lazar², João R. Sato³, Nadja Igarashi¹, Danilo F. Santaela¹, Shirley S. Lacerda¹, Edson Amaro Jr.¹ and Elisa H. Kozasa¹

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<table>
<thead>
<tr>
<th>TABLE 1</th>
<th>Group characteristics.</th>
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<tbody>
<tr>
<td></td>
<td>Control Group (n = 21)</td>
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<tr>
<td>Age (years)</td>
<td>67.9 (1.004)</td>
</tr>
<tr>
<td>Years of Education</td>
<td>14.6 (0.42)</td>
</tr>
<tr>
<td>BMI, kg/m²</td>
<td>25.3 (0.63)</td>
</tr>
<tr>
<td>BDI</td>
<td>7.4 (1.2)</td>
</tr>
<tr>
<td>MMSE</td>
<td>28.8 (0.28)</td>
</tr>
<tr>
<td>IADL</td>
<td>26.8 (0.14)</td>
</tr>
<tr>
<td>Years of yoga practice</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Data expressed as mean (± standard deviation; BDI, Beck Depression Inventory; MMSE, Mini-Mental State Examination; IADL, Instrumental Activities of Daily Living)
Healthy elderly women who practiced Hatha Yoga for at least 8 years had greater prefrontal cortical thickness than a group of matched controls.

This fact may be associated with cognitive preservation.
Greater Anteroposterior Default Mode Network Functional Connectivity in Long-Term Elderly Yoga Practitioners

Seed to Voxel Connectivity Analysis

Anterior
MPFC

Posterior
PCC - Precuneus
Seed: Medial Prefrontal Cortex

Angular Gyrus (right)

p<0.05

p<0.05
➢ Elderly women with ≥ 8 years of yoga have greater intra-network anteroposterior brain resting-state functional connectivity of the DMN.

➢ This may indicate influences of Yoga for a healthier cognitive ageing.

To maximise results
Start a.s.a.p.
Follow the traditional approach
Remember, Yoga is Meditation  

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