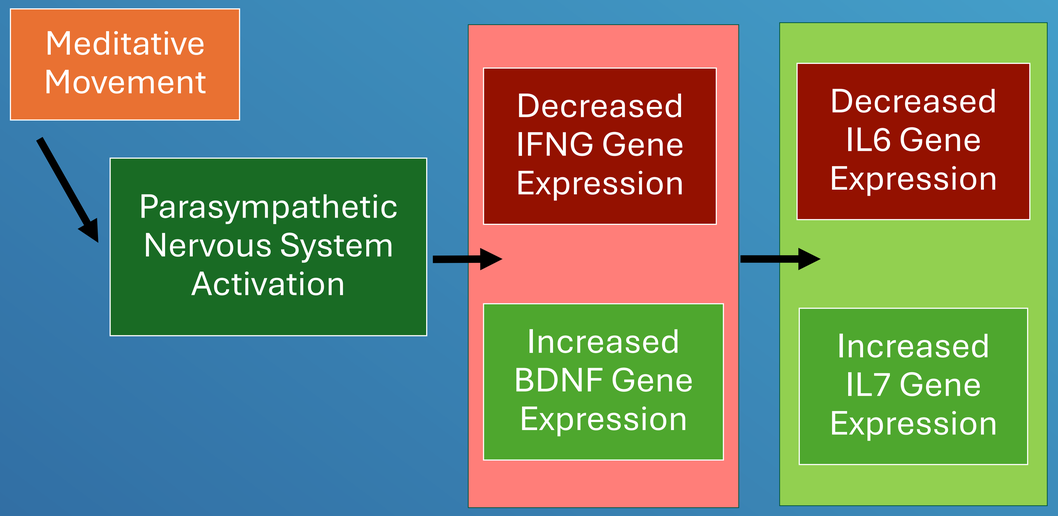
Meditative Movement Reduces Allostatic Load in Breast Cancer Survivors:
Reducing Inflammation, Boosting Immune Response, and Enhancing Brain Cell Growth

Francisco Muñoz, PhD; Linda Larkey, PhD; Richard Lee, MD

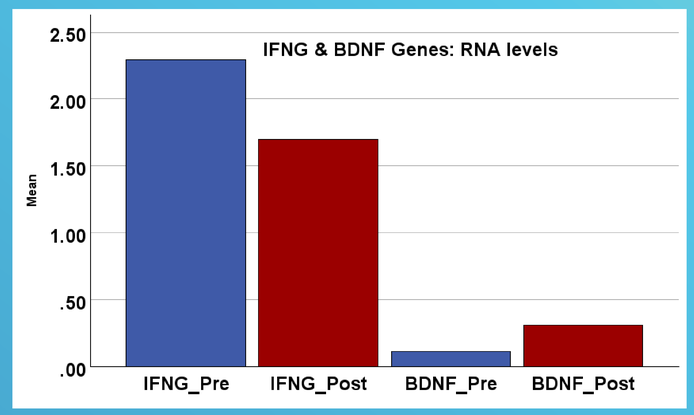
Introduction: Breast cancer survivors report decrements in cognitive performance.

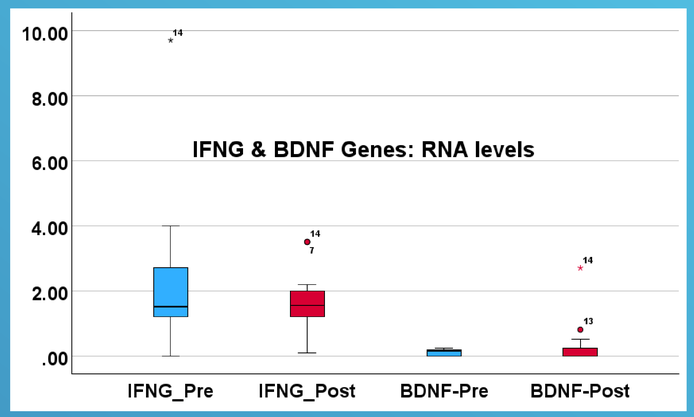
- **Allostatic Load**: Multi-systemic "wear and tear" on brain and body, associated with increased pro-inflammatory response and cognitive impairment.[1]
- **Interferon Gamma (IFNG) gene**: Pro-inflammatory cytokine that plays an important role in an array of immune responses.[2]
- **Brain-Derived Neurotrophic Factor (BDNF) Genes**: Associated with cognitive functioning.[4]
- **Interleukin-6 (IL6)**: Associated with inflammation.[2]
- **Interleukin-7 (IL7**): Increase crucial for growth of B and T cells.[3]
- **Meditative Movement**: Qigong/Tai Chi Easy, combines meditation and exercise, engaging the parasympathetic nervous system to calm sympathetic nervous system activation associated with allostatic load.[5]

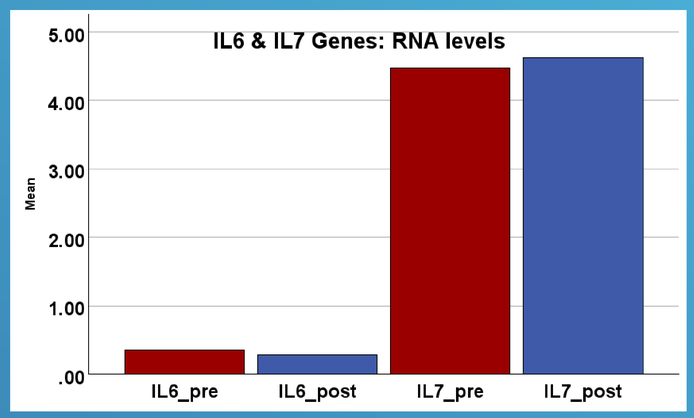


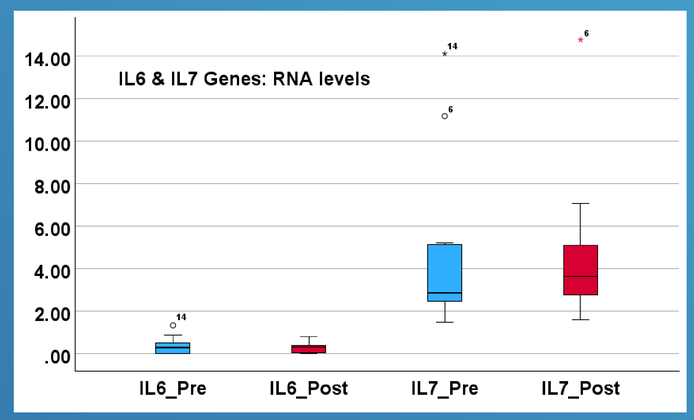
Method:

- **Design**: Single group, pre- to post-intervention assessment.
- **Participants**: 14 breast cancer survivors (mean age = 61), ≥45 years of age, female, Stage 0–III, 6 months to 5 years past primary treatment.
- **Intervention**: 8-week meditative movement program. One hour in-person group practice/week.
- **Assessments**: Gene expression of IFNG, IL6, IL7 & BDNF, via pre- and post- blood samples.









Results:

- **IFNG Gene Expression**: Pre/post decrease, r = 0.55, p = 0.04.
- **BDNF Gene Expression**: Pre/post increase, r = 0.62, p = 0.02.
- **IL6 Gene Expression**: Pre/post decrease, r = 0.12, *p* = 0.68.
- **IL7 Gene Expression**: Pre/post increase, r = 0.72, p < 0.01.
- **Simple linear regression analysis** indicated that the IFNG change explained BDNF, IL6, and IL7 gene expression variation. In BDNF, ($F(1,12)=13.1$, $p<.01$), $R^2=.52$; in IL6, ($F(1,12)=7.36$, $p=.02$), $R^2=.38$; in IL7, ($F(1,12)=8.79$, $p=.01$), $R^2=.42$.

Conclusion: Meditative movement may contribute to the alleviation of allostatic load-induced cognitive impairment, immune suppression, and inflammation among breast cancer survivors, possibly through the mechanisms of gene expression changes. Limitations: Small sample size. Future direction: RCT with powered sample size

References:

1. Guidi J, Lucente M, Sonino N, Fava GA. Allostatic Load and Its Impact on Health: A Systematic Review. Psychother Psychosom. 2021;90(1):11-27. doi: 10.1159/000510696. Epub 2020 Aug 14. PMID: 32799204.
2. Yap NY, Toh YL, Tan CJ, Acharya MM, Chan A. Relationship between cytokines and brain-derived neurotrophic factor (BDNF) in trajectories of cancer-related cognitive impairment. Cytokine. 2021 Aug;144:155556. doi: 10.1016/j.cyto.2021.155556. Epub 2021 May 10. PMID: 33985854; PMCID: PMC8585614.
3. Winer H, Rodrigues GOL, Hixon JA, Aiello FB, Hsu TC, Wachter BT, Li W, Durum SK. IL-7: Comprehensive review. Cytokine. 2022 Dec;160:156049. doi: 10.1016/j.cyto.2022.156049. Epub 2022 Oct 3. PMID: 36201890.
4. Lange M, Joly F, Vardy J, Ahles T, Dubois M, Tron L, Winocur G, De Ruiter MB, Castel H. Cancer-related cognitive impairment: an update on state of the art, detection, and management strategies in cancer survivors. Ann Oncol. 2019 Dec 1;30(12):1925-1940. doi: 10.1093/annonc/mdz410. PMID: 31617564; PMCID: PMC8109411.
5. Larkey L, Szalacha L, Rogers C, Jahnke R, Ainsworth B. Measurement pilot study of the Meditative Movement Inventory (MMI). J Nurs Meas. 2012;20(3):230-43. doi: 10.1891/1061-3749.20.3.230. PMID: 23362559.

Grateful for support from the Cherng Family Foundation.