Exploración de las diferencias del volumen cerebral en meditadores expertos de Sahaja Yoga en comparación con no meditadores

RESUMEN

Palabras clave: Meditación Sahaja, regiones frontales, neuroimagen, práctica de meditación.

La meditación Sahaja yoga es una meditación de atención plena basada en la introspección que se apoya en los sistemas energéticos Kundalini y Chakra (Landhe & Atulkar, 2022). Se asocia a mejoras en la salud mental y física, con efectos beneficiosos en trastornos que implican rumiación como la depresión, el estrés, la ansiedad y el trastorno por déficit de atención con hiperactividad (Hernández et. al. 2018).

Nuestro objetivo es analizar diferencias volumétricas en regiones cerebrales que podrían estar asociadas a esta sintomatología entre practicantes regulares de meditación Sahaja Yoga y no practicantes. Para ello, reclutamos 46 sujetos y recogimos datos demográficos, información sobre su relación con este tipo de meditación y medidas del volumen de materia gris (mediante una adquisición anatómica de resonancia magnética T1). La muestra se dividió en 2 grupos, meditadores regulares de Sahaya Yoga y no meditadores. Los volúmenes cerebrales se calcularon con el programa Freesurfer, y se utilizaron modelos lineales generales en SPSS para compararlos entre grupos, covariando con el volumen intracraneal y los años de educación. Además, realizamos correlaciones parciales para explorar si el aumento del volumen en meditadores se asociaba a la práctica continuada de meditación.

Nuestros resultados muestran que los meditadores habituales presentan un mayor volumen en comparación con los no meditadores en el cíngulo anterior caudal y rostral izquierdo, el giro orbitofrontal medial izquierdo, el giro frontal medio y superior, el giro paracentral izquierdo, el córtex entorrinal izquierdo, la circunvolución parahipocampal izquierda, la ínsula izquierda, el caudado izquierdo, el fusiforme derecho, el cíngulo posterior derecho, el giro precentral derecho y el giro temporal superior derecho. En los meditadores, el volumen de las regiones frontales (y de la corteza entorrinal) aumenta en relación con el número de años de meditación.

En futuras investigaciones, animamos a incluir datos sobre salud mental y bienestar.

Exploring brain volume differences in expert Sahaja Yoga meditators in comparison with non-meditators

ABSTRACT

Keywords: Sahaja meditation, frontal regions, neuroimaging, meditation practice.

Sahaja yoga meditation is a type of mindfulness meditation based on introspection, and is supported by the Kundalini and Chakra energy systems (Landhe & Atulkar, 2022). It is associated with improvements in mental and physical health, with beneficial effects on mental disorders that involve rumination, such as depression, stress, anxiety and attention deficit hyperactivity disorder (Hernández et. al. 2018).

The purpose of our study is to analyse the volumetric differences in brain regions that could be associated with this symptomatology between regular practitioners of Sahaja Yoga meditation and non-practitioners. To this end, we included a sample of 46 subjects and collected their demographic data, information on the relationship of the participants with this type of meditation, and measurements of grey matter volume (through an anatomical T1 magnetic resonance imaging acquisition). The sample was divided into 2 groups, regular Sahaya Yoga meditators and non-meditators. Brain volumes were computed using the Freesurfer segmentation pipeline, and SPSS was used to perform general linear models in order to compare brain volumes between groups while covarying by intracranial volume and years of education. We also performed partial correlations to explore whether the increase in brain volume in the meditators group was associated with the continuous practice of meditation.

Our results show that regular Sahaya Yoga meditators present higher volume in comparison to non-meditators in the left caudal and rostral anterior cingulate, left medial orbitofrontal, middle, and superior frontal gyri, left paracentral gyrus, left entorhinal cortex, left parahipocampal gyrus, left insula, left caudate, right fusiform, right posterior cingulate, right precentral gyrus, and right superior temporal gyrus. Moreover, among the meditators, the volume of frontal brain regions and the entorhinal cortex increases in relation to the number of years of meditation.

In future research we encourage the inclusion of data on mental health and well-being.

EXPLORING BRAIN VOLUME DIFFERENCES IN EXPERT SHAJA YOGA MEDITATORS IN COMPARISION WITH NON-MEDITATORS

Student: Natalia Tortosa Micó
Tutor: Maria Picó Pérez

INTRODUCTION

Sahaja meditation is a type of mindfulness meditation that is achieved through **introspection** supported by the Kundalini energy system and the Chakras (Landhe & Atulkar, 2022).

It is associated with **beneficial effects on mental disorders** with mental wandering and rumination as main components such as depression, stress, anxiety and Attention Deficit Hyperactivity Disorder (Hernandez et. al., 2018).

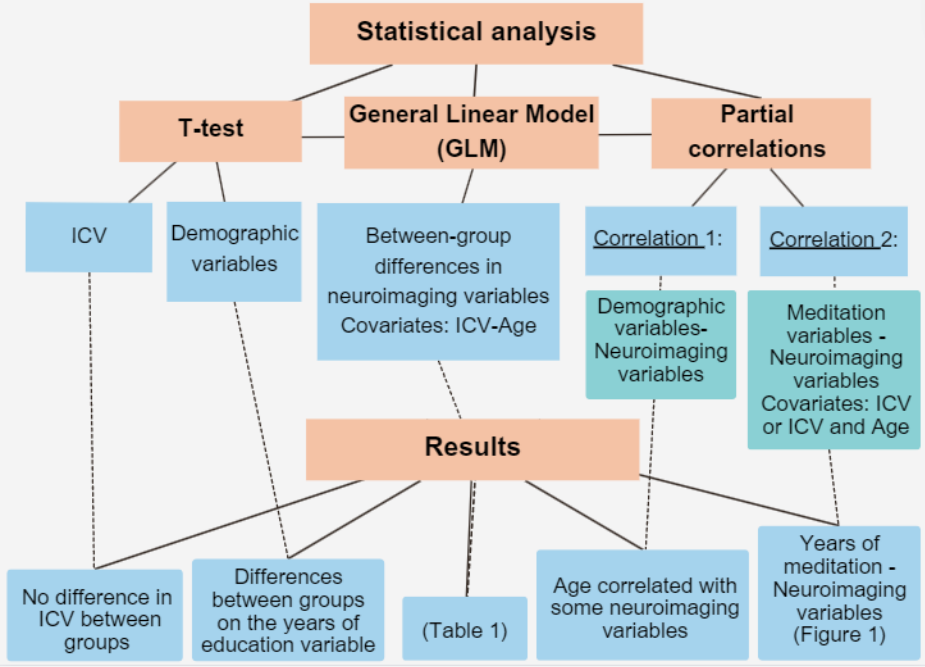
Our aim is to **analyse differences in volume** between regular practitioners of Sahaja Yoga meditation and non-practitioners.

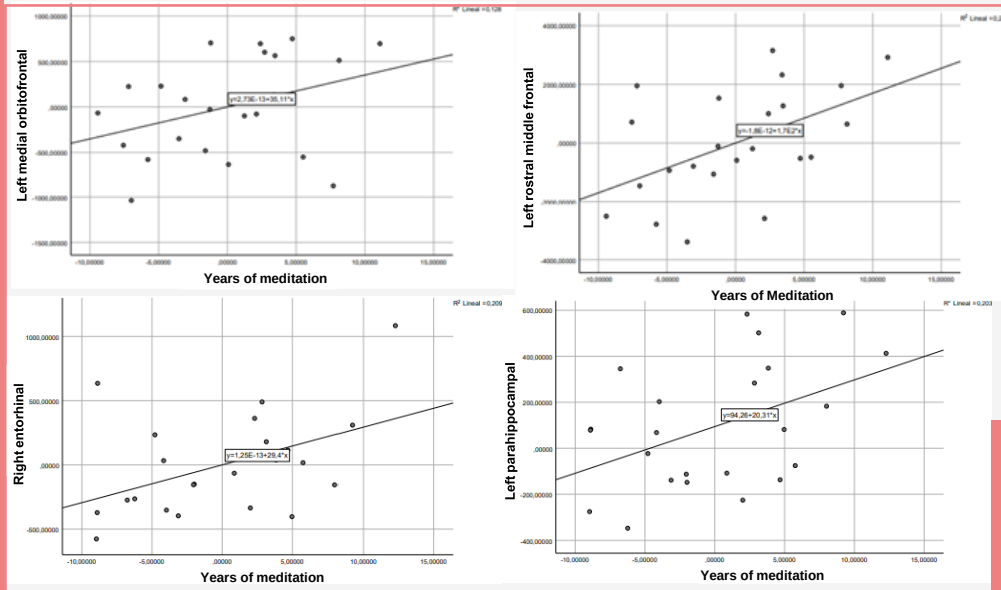
Our hypothesis is that in the **meditator group there will be regions** (mainly frontal and limbic regions) **with higher volume** compared to the non-meditator group.

METHODS & RESULTS

Área	Model F(gl)	Sig.	Group	ICV	'Years of education'
L_caudalanteriorcingulate	3,574 (3)	0,022	0,006	0,263	0,024
L_caudalmiddlefrontal	9,333 (3)	0,000	0,026	0,000	0,137
L_entorhinal	3,080 (3)	0,038	0,037	0,032	0,068
L_medialorbitofrontal	7,025 (3)	0,001	0,010	0,000	0,147
L_parahippocampal	5,682 (3)	0,002	0,005	0,001	0,159
L_paracentral	7,180 (3)	0,001	0,020	0,000	0,564
L_parsorbitalis	4,219 (3)	0,011	0,031	0,003	0,366
L_rostralanteriorcingulate	4,946 (3)	0,005	0,019	0,001	0,427
L_rostralmiddlefrontal	7,495 (3)	0,000	0,006	0,000	0,073
L_superiorfrontal	7,066 (3)	0,001	0,039	0,000	0,535
L_insula	8,872 (3)	0,000	0,022	0,000	0,299
R_entorhinal	5,892 (3)	0,002	0,033	0,001	0,015
R_fusiform	6,252 (3)	0,001	0,012	0,000	0,235
R_medialorbitofrontal	5,314 (3)	0,003	0,029	0,001	0,561
R_paracentral	6,211 (3)	0,001	0,009	0,001	0,874
R_posteriorcingulate	4,344 (3)	0,009	0,020	0,004	0,712
R_precentral	7,095 (3)	0,001	0,009	0,000	0,714
R_rostralmiddlefromtal	7,781 (3)	0,000	0,001	0,000	0,062
R_superiorfrontal	8,727 (3)	0,000	0,003	0,000	0,459
R_superiortemporal	5,122 (3)	0,004	0,042	0,001	0,867
L_caud	6,267 (3)	0,001	0,022	0,001	0,582

(Table 1). Regions differing between groups on the neuroimaging variables.





(Figure 1). Scatter plots of positive relationship with years of meditating.

DISCUSSION & CONCLUSIONS

The **hypothesis is confirmed** that the regular Sahaja Yoga practitioners show greater volume in frontal and limbic brain regions. These areas perform cognitive functions such as emotional processing ang regulation, beheavioural control, encoding and recognition of environment scenes, control of automatic and endocrine responses, contribute to emotional expression, involvement in episodic, autobiographical and spatial memory and planning.

Results suggesting that the more practice within the group meditators, the more volume in brain regions, indicate that this is a **meditation-specific effe**ct and not due to other factors that might be differing between groups.

Most of our results are in line with previous studies using different volumetric analysis approaches (Freesurfer in our study, VBM in others), pointing to the **robustness of the results.**

LIMITATIONS

Our study did not have available **measures of mental health and/or well-being** of the research participants, it would be of interest to take these data into account for future research.

Bibliografía.

Barrós-Loscertales, A., Hernández, S. E., Xiao, Y., González-Mora, J. L., & Rubia, K. (2021). Resting State Functional Connectivity Associated With Sahaja Yoga Meditation. Frontiers in Human Neuroscience, 15, 614882. doi: 10.3389/fnhum.2021.614882.

Cabrales Paffen, A. (2015). Neuropsicología y la localización de las funciones cerebrales superiores en estudios de resonancia magnética funcional con tareas [Neuropsychology and the localization of superior brain functions in fMRI with task studies]. Acta Neurol Colomb, 31(1), 92-100.

Flores Lázaro, J. C., Ostrosky-Solís, F. (2008). Neuropsicología de Lóbulos Frontales, Funciones Ejecutivas y Conducta Humana. Revista Neuropsicología, Neuropsiquiatría y Neurociencias, 8(1), 47-58.

Grateron Colmenares, L. (1997). Desarrollo postnatal de la corteza entorrinal humana: estudio citoarquitectónico e inmunohistoquímico (Tesis doctoral). Universidad de Navarra, España

Hernández, S. E., Barros-Loscertales, A., Xiao, Y., & González-Mora, J. L. (2018). Gray Matter and Functional Connectivity in Anterior Cingulate Cortex are Associated with the State of Mental Silence During Sahaja Yoga Meditation. Neuroscience, 371, 395-406. doi: 10.1016/j.neuroscience.2017.12.017.

Hernández, S. E., Suero, J., Barros, A., González-Mora, J. L., & Rubia, K. (2016). Increased Grey Matter Associated with Long-Term Sahaja Yoga Meditation: A Voxel-Based Morphometry Study. PLOS ONE, 11(3), e0150757. doi: 10.1371/journal.pone.0150757

Hernández, S. E., Suero, J., Rubia, K., & González-Mora, J. L. (2015). Monitoring the neural activity of the state of mental silence while practicing Sahaja yoga meditation. Alternative and Complementary Medicine, 21(3), 175-179. doi: 10.1089/acm.2013.0450

Londhe, A., & Atulkar, M. (2022). ECG Intervals and Segments Detection and Characterization for Analyzing Effects of Sahaja Yoga Meditation. International Journal of Ambient Computing and Intelligence (IJACI), 13(1), 13. doi: 10.4018/IJACI.300796