

LONG-TERM YOGA PRACTITIONERS ARE MORE TOLERANT TO PAIN AND HAVE MORE GREY MATTER THAN MATCHED CONTROLS: A CROSS SECTIONAL STUDY

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In Western societies yoga mainly consists of a combination of postures, breathing exercises and meditation. Various anecdotal lines of evidence point to a potential impact of yoga practice on pain perception. In addition, long term meditation practice was found to positively impact brain anatomy.

Our aim was to compare pain tolerance and brain volumes of a group of long-term yoga practitioners to a group of sedentary controls who had never practiced yoga, meditation or martial arts. Pain tolerance was tested by asking subjects to submerge their non dominant hand in cold circulating water ($\sim 5^{\circ}\text{C}$) for as long as they could, up to a 120-s maximum. MR imaging was performed and analysed and the general linear model was used to assess differences in total grey matter (GM), white matter (WM), cerebrospinal fluid (CSF), total brain volumes, and cold pain tolerance between yoga practitioners and controls.

Correlation coefficients between brain volumes showing differences between groups, pain tolerance and weekly yoga practice were assessed. Groups were matched for gender (Y: 5 females/4 males; C: 3 females/4 males), age (means \pm SE; Y: 36.3 yrs \pm 2.4; C: 39.0 yrs \pm 2.8), Body Mass Index (Y: 21.5 \pm 0.8; C: 23.2 \pm 0.9), education (Y: 15.4 yrs \pm 0.4; C: 15.9 yrs \pm 0.4) and amount of weekly exercises outside of yoga (Y: 4.7 hrs \pm 0.7; C: 3.0 hrs \pm 0.8) (all $F_{s(1,14)} < 2.68$; $p_{s} > 0.12$). Yoga practitioners included in this study had practiced yoga regularly for an average of 9.8 yrs (\pm 1.2) and devoted on average 8.8 hrs/week (\pm 1.5) to their practice.

Yoga practitioners tolerated pain more than three times longer than controls (Y: 88.2 s \pm 10.8; C: 27.6 s \pm 12.2). They also showed greater GM volumes compared with controls (Y: 680420 mm³ \pm 13287; C: 633636 mm³ \pm 15066; $F(1,14) = 5.4$; $p < 0.05$). There was no difference in WM, CSF or total brain volumes between groups (all $p_{s} > 0.16$). GM matter volume was positively correlated with the amount of weekly yoga practice ($r^2 = 0.44$; $p < 0.01$) and cold pain tolerance ($r^2 = 0.36$; $p < 0.05$) such that subjects who practiced yoga for more hours weekly had more grey matter and subjects with greater pain tolerance had larger grey matter volumes.

These results suggest that long-term yoga practice can impact both pain perception and brain anatomy