

## Publication

## Sports and brain morphology - a voxel-based morphometry study with endurance athletes and martial artists

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Physical exercises and motor skill learning have been shown to induce changes in regional brain morphology, this has been demonstrated for various activities and tasks. Also individuals with special skills show differences in regional brain morphology. This has been indicated for professional musicians, London taxi drivers, as well as for athletes like dancers, golfers and judokas. However little is known about whether sports with different metabolic profiles (aerobic vs. anaerobic) are associated with different patterns of altered brain morphology. In this cross-sectional study we investigated two groups of high-performance athletes, one group performing sports that are thought to be mainly aerobic, and one group performing sports known to have intermittent phases of anaerobic metabolism. Using high-resolution structural imaging and voxel-based morphometry (VBM), we investigated a group of 26 male athletes consisting of 13 martial artists and 13 endurance athletes as well as a group of non-exercising men (n=13). VBM analyses revealed higher gray matter (GM) volumes in the supplementary motor area/dorsal premotor cortex (BA 6) in both athlete groups as compared to the control group. In addition, endurance athletes showed significantly higher GM volume in the medial temporal lobe (MTL), specifically in the hippocampus and parahippocampal gyrus, which was not seen in the martial arts group. Our data suggest that high-performance sports are associated with changes in regional brain morphology in areas implicated in motor planning and motor learning. In addition high-level endurance sports seem to affect MTL structures, areas that have previously been shown to be modulated by aerobic exercise.

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