Specialized training of complex motor skills may induce sports-specific structural changes in the human brain

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A new study, using brain imaging technology, reveals structural adaptations in short-track speed skaters' brains which are likely to explain their extraordinary balance and co-ordination skills. The work by Im Joo Rhyu from the Korea University College of Medicine, and colleagues, is published online in Springer's journal *Cerebellum*.

The cerebellum in the brain plays an essential role in balance control, coordinated movement, and visually guided movement, which are key abilities required for short-track speed skaters as they glide on perfectly smooth ice, cornering and passing at high speeds. Previous studies have shown that damage to the cerebellum results in impaired balance and coordination. In addition, structural changes in the brain have been documented following training of complex motor skills, in both jugglers and basketball players for instance. Are these changes sports-specific?

To assess the effect of short-track speed skating training on the relative structure and size of the two brain hemispheres, the authors analyzed brain MRI scans of 16 male professional short-track speed skaters. They compared them to scans of 18 non-skaters, who did not engage in regular exercise.

They found that skaters had larger right hemispheres of the cerebellum and vermian lobules VI-VII (the lobes connecting the left and right parts of the cerebellum) than non-skaters. These results suggest that the

specialized abilities of balance and coordination in skaters are associated with a certain amount of flexibility in the structure of the right hemisphere of the cerebellum and vermian VI-VII.

Why do the structural changes occur to the right side of the cerebellum? Gliding on smooth ice requires specialized abilities to control dynamic balance and coordination. During cornering at high speed, short-track speed skaters turn only to the left while maintaining balance on their right foot. Standing on the right foot activates the right lobes of the cerebellum.

In addition, learning a visually guided task is thought to occur in the right side of the brain. Therefore the larger volume of the right hemisphere of the cerebellum in these skaters is likely to be associated with the type of movements which the sport requires, for strong visual guidance while cornering and passing.

The authors conclude: "Short-track speed skaters' specialized abilities of balance and coordination stimulate specific structural changes in the cerebellum, following extensive training. These changes reflect the effects of extraordinary abilities of balance and coordination on the right region of the brain."

More information: Park IS, Rhyu IJ et al (2012). Volumetric analysis of cerebellum in short-track speed skating players. *Cerebellum*; DOI 10.1007/s12311-012-0366-6

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