

Knee Cartilage and Meniscus in Recreational Marathon Runners: a MRI T2 * Mapping Investigation

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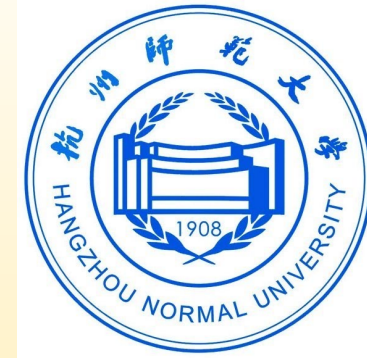
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Faculty Disclosure



I have no real or perceived conflicts of interest that relate to this presentation.

I have the following real or perceived conflicts of interest that relate to this presentation:

| Affiliation / Financial interest | Commercial company |
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| Grants/research support: | None |
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| Other support / potential conflict of interest: | None |

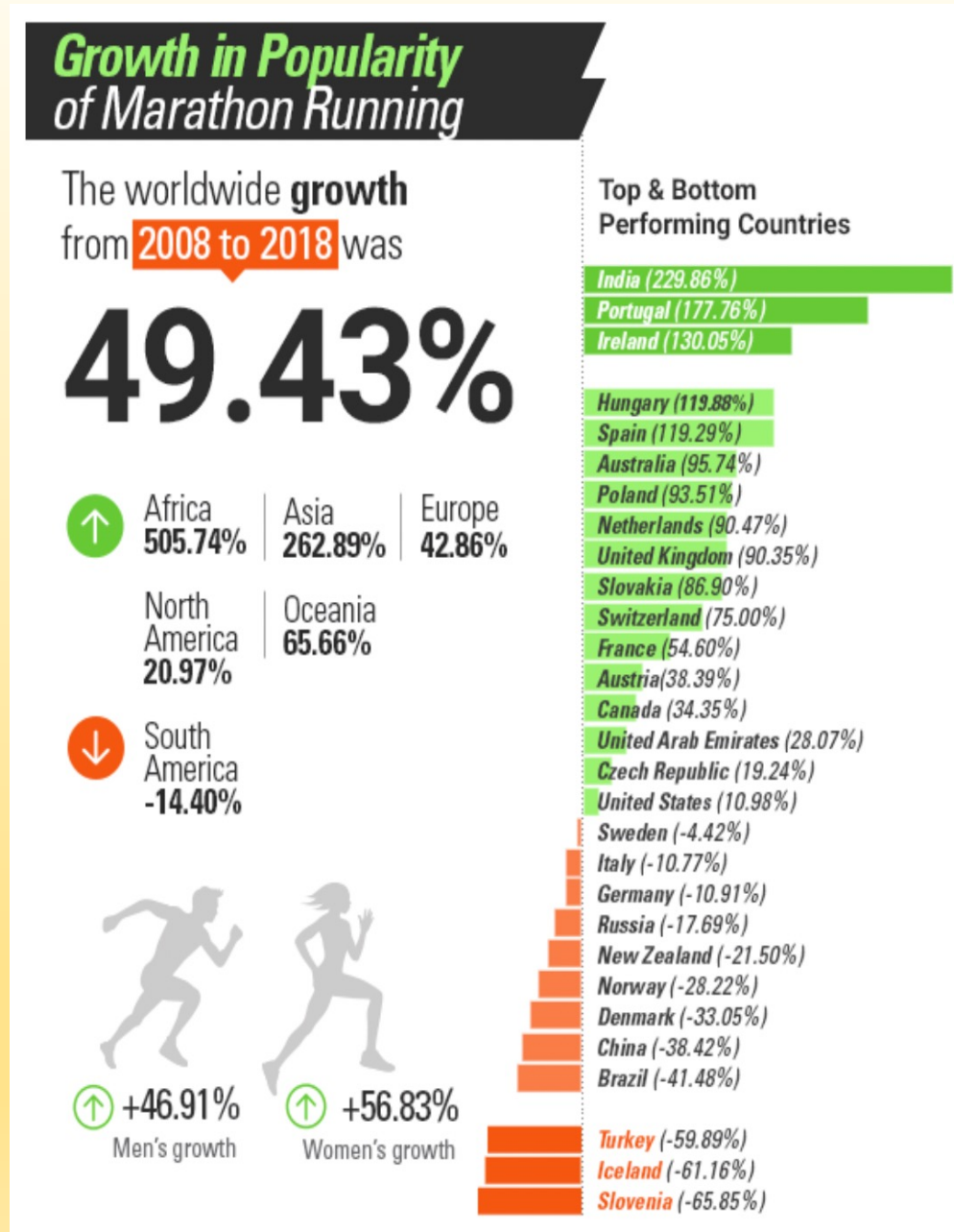
There are increasingly large number of participants in marathon running globally

Global marathon statistics

- ❑ Finishers: 1,298,725
- ❑ Average finish time: 4:29:53
- ❑ 31.92% female participation (68.08% male)
- ❑ Most participants: USA (456,700), UK (97,254) & Germany (86,032)

Changes in the past 10 years

- ❑ Participation growth: +49.43%



Among recreational marathon runners, the LTC, cMFC, and anterior angle of the meniscus were the most vulnerable sites to repetitive loading.

Background / Aims:

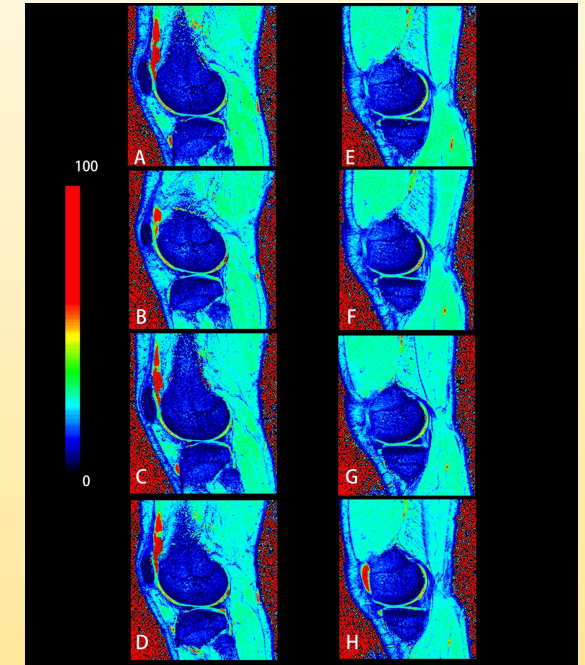
- ❖ The prevalence of knee cartilage injury among athletes is significantly higher than that of the general population, which can be attributable to the overuse of athletes
- ❖ It is of clinical significance to determine the impact of running in knee joint in order to prevent OA.
- ❖ T2* mapping is sensitive to changes in the anisotropy of collagen network and the water content of collagen tissue in articular cartilage
- ❖ The current study was performed to examine the effects of long-distance running on the knee cartilage in healthy amateur marathon runners and their sedentary counterparts by using T2* mapping.

Subjects and Methods:

- ❖ The study was approved with international standards and the Declaration of Helsinki by the Ethics Committee of the Affiliated Hospital of Hangzhou Normal University (2019[ethics 02]-HS-15)[17]. Written informed consent were obtained from all study participants before the study.
- ❖ The inclusion criteria for runners are as the following: (1) without history of knee pain, trauma, and surgery; (2) had more than one marathon event experience; (3) running for more than three years, running more than three times per week, each exercise duration is greater than 30 minutes; (4) male.
- ❖ The exclusion criteria are: (1) subjects with injury/pain; (2) images showed articular cartilage morphological injuries, Whole-Organ Magnetic Resonance Imaging Score (WORMS) grade \geq 2; (3) MRI contraindications.

Exercise protocol:

- ❖ Repeated magnetic resonance (MR) scans were performed on both knees before (t0), immediately after (t1), 3 days after (t2) and 1 week after (t3) the half marathon running on a 1.5T MR scanner (MAGNETOM Area, Siemens Healthcare, Erlangen, Germany).
- ❖ All amateur marathon runners perform the first MR scan within 4 weeks before running (t0). The participants were required to avoid strenuous activities within three days before the examination and rest for another 30 minutes before the scan to reduce the impact of early activities on the knee cartilage.
- ❖ The second MR scan was performed immediately after running a half-marathon (21.0975 km) (t1), The third / fourth MR scan was performed at the third day/ one week after running (t2 / t3).



- ❖ Warm colors (i.e. red tones) represent high T2* values on the T2* mapping pseudo-color image, and cool colors (i.e. blue tones) represent low T2* values. T2* pseudo-color maps of knee cartilage before (A, E), immediately after (B, F), 3 days (C, G), and 1 week after running (D, H).
- ❖ In the femorotibial cartilage (A-D, E-F), the red color and green color increased and the blue color decreased after running.

Table 1: The characteristics of the participants.

| | Age | Height | Weight | BMI | Finnish time | Pace |
|----------------|----------------|-----------------|----------------|------------------------|------------------|---------------|
| | (year) | (mm) | (kg) | (kg / m ²) | (min) | (min/km) |
| Runner | 40.9 \pm 8.8 | 169.5 \pm 2.7 | 66.4 \pm 5.2 | 23.1 \pm 1.8 | 129.6 \pm 20.7 | 6.1 \pm 1.0 |
| Non-exercisers | 39.4 \pm 9.1 | 167.5 \pm 6.9 | 68.8 \pm 10 | 24.5 \pm 3.1 | / | / |
| P value | 0.699 | 0.448 | 0.549 | 0.269 | / | / |

Conclusions:

- ❖ The LTC, cMFC and anterior angle of meniscus were the most sensitive areas to repeated loading in recreational marathon runners. The recovery time of T2* value of knee cartilage after a half marathon was 3 to 7 days. It can be concluded that a half-marathon would not exert irreversible effects on the knee cartilage and meniscus in recreational runners.

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Thank you!

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