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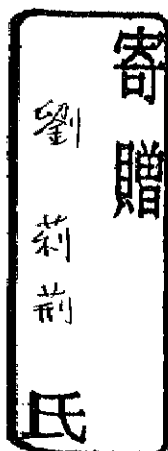
**Effects of Long-Term Different Physical Exercises  
on Volumetric Bone Mineral Density, Bone  
Geometric Properties and Strength Index:  
A pQCT Study**

**2004**

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The present thesis is based on the following papers:

1. Nara-Ashizawa N, **Liu LJ**, Higuchi T, Tokuyama K, Hayashi K, Shirasaki Y, Amagai H and Saitoh S. Paradoxical adaptation of mature radius to unilateral use in tennis playing. *Bone* 30: 619-623, 2002.
2. **Liu LJ**, Maruno R, Mashimo T, Sanka K, Higuchi T, Hayashi K, Shirasaki Y, Mukai N, Saitoh S and Tokuyama K. Effects of physical training on cortical bone at the mid-tibia assessed by pQCT. *J Appl Physiol* 95: 219-224, 2003.
3. Takano J, Fujii N, Mukai N, **Liu LJ**, Hayashi K, Shirasaki Y, Saitoh S and Tokuyama K. Jumper's tibia assessed along 64 directions centering center of gravity of the bone by pQCT. *Jpn J Phys Fitness Sports Med* 53: 123-130, 2004 (in Japanese).
4. **Liu LJ**, Tokuyama K. If exercise does not increase bone mineral density, what does it change? *Jpn J Phys Fitness Sports Med* (in press, 2005).

## ABBREVIATIONS

<b>aBMD</b>	Areal bone mineral density
<b>ANOCOVA</b>	Analysis of covariance
<b>ANOVA</b>	Analysis of variance
<b>BMC</b>	Bone mineral content
<b>BMD</b>	Bone mineral density
<b>BVF</b>	Bone volume fraction
<b>CT</b>	Computed tomography
<b>DPA</b>	Dual-photon absorptiometry
<b>DXA</b>	Dual-energy X-ray absorptiometry
<b>MRI</b>	Magnetic resonance imaging
<b>NIH</b>	National institutes of health
<b>PMI</b>	Polar moment of inertia
<b>pQCT</b>	Peripheral quantitative computed tomography
<b>QUS</b>	Quantitative ultrasound
<b>QMRI</b>	Quantitative magnetic resonance imaging
<b>SD</b>	Standard deviation
<b>SM</b>	Section modulus
<b>SPA</b>	Single-photon absorptiometry
<b>SSI</b>	Strength strain index
<b>vBMD</b>	Volumetric bone mineral density