

TABLES

Table 1. The effect of different physical activities on human bone separately in previous DXA and pQCT studies

	DXA studies	pQCT studies
BMD	<u>Extremity and whole body (areal BMD)</u>	<u>Radial shaft (volumetric BMD)</u>
	Dominant arm > Non-dominant arm*	Dominant arm \cong Non-dominant arm
	Tennis or squash > Control	Tennis = Control
	Weight bearing exercise > Non-weight bearing exercise	
	Non-weight bearing exercise = Control	
Cross-section Area	?	<u>Radial shaft</u> Dominant arm \cong Non-dominant arm Tennis > Control
		<u>Tibial shaft</u> Jump or Triple Jump \cong Control
CONCLUSION	aBMD (mg/cm ²) \uparrow	vBMD (mg/cm ³) \rightarrow Area \uparrow (cortical drift, periosteal drift)

* Dominant or non-dominant arm means that of tennis players.

Table 2. Characteristics of recreational female tennis players

Range(years)	Number	Age(years)	Height(cm)	Weight(kg)	Starting age(years)	Training period(years)	Menopause (n/group)
35-40	10	38.1 ± 1.9	155.0 ± 4.5	49.4 ± 4.0	33.9 ± 1.6	4.2 ± 1.6	0/10
41-50	58	45.1 ± 2.3	158.5 ± 5.1	54.5 ± 6.0 ^a	35.2 ± 3.0	9.9 ± 3.8 ^a	4/58
51-55	24	52.9 ± 1.5	155.6 ± 5.3 ^b	53.9 ± 5.9 ^a	37.6 ± 3.9 ^{ab}	15.3 ± 3.9 ^{ab}	16/24

Values are mean ± SD.

^a Significantly different from the 35-40 year age group.

^b Significantly different from the 41-50 year age group.

Table 3. PQCT parameters of the radius

	Nondominant	Dominant	Increase (%)	Z score
Midradius				
Endocortical area (cm ²)	0.300 ± 0.106	0.278 ± 0.094 ^a	-7.3	-0.21
Periosteal area (cm ²)	1.061 ± 0.15	1.007 ± 0.14 ^a	-5.1	-0.36
Cortical thickness (cm)	0.275 ± 0.027	0.272 ± 0.028	-1.1	-0.11
Cortical BMD (g/cm ³)	1.946 ± 0.082	1.942 ± 0.087	-0.2	-0.05
Whole BMD (g/cm ³)	1.404 ± 0.166	1.415 ± 0.164	+8.0	+0.07
BMC (g/mm)	0.147 ± 0.017	0.141 ± 0.017 ^a	-4.1	-0.36
Moment of inertia (mm ⁴)	1744 ± 460	1598 ± 413 ^a	-8.4	-0.32
Section modulus (mm ³)	233 ± 44	219 ± 41 ^a	-6.0	-0.32
SSI (mm ³)	376 ± 71	352 ± 66 ^a	-6.4	-0.34
Distal radius				
Periosteal area (cm ²)	4.16 ± 0.60	3.77 ± 0.56 ^a	-9.4	-0.65
Trabecular BMD (g/cm ³)	0.363 ± 0.070	0.383 ± 0.060 ^b	+5.5	+0.29
Whole BMD (g/cm ³)	0.656 ± 0.120	0.756 ± 0.115 ^a	+15.2	+0.83
BMC (g/mm)	0.273 ± 0.065	0.286 ± 0.065	+4.9	+0.21

Values are mean ± SD.

Side-to-side difference: ^a*p* < 0.01, ^b*p* < 0.05.

Table 4. Correlation coefficient of pQCT parameters and age or training period

	Age				Training,
	Mean ^a	Dominant ^b	Nondominant ^c	Side-to-side ^d	Side-to-side ^e
Midradius					
Endocortical area	0.193	0.151	0.229 ^f	-0.208 ^f	-0.159
Periosteal area	0.172	0.155	0.178	-0.069	0.001
Cortical thickness	-0.153	-0.080	-0.215 ^f	0.203	0.208 ^f
Cortical BMD	-0.508 ^g	-0.467 ^g	-0.404 ^g	-0.085	-0.120
Whole BMD	-0.325 ^g	-0.289 ^g	-0.333 ^g	0.079	0.040
BMC	-0.099	-0.078	-0.106	0.042	0.068
Moment of inertia	0.125	0.134	0.108	0.024	0.046
Section modulus	0.152	0.165	0.128	0.050	0.127
SSI	0.076	0.087	0.059	0.036	0.086
Distal radius					
Periosteal area	0.083	0.035	0.116	-0.117	-0.050
Trabecular BMD	-0.044	-0.100	-0.116	0.028	0.139
Whole BMD	-0.134	-0.026	-0.051	0.033	0.033
BMC	0.021	0.008	0.029	-0.020	0.001

Values are mean \pm SD.

^aAge vs. mean of both arms; ^bAge vs. dominant radius; ^cAge vs. nondominant radius;

^dAge vs. side-to-side difference; ^eTraining period vs. side-to-side difference.

^f $p < 0.05$, ^g $p < 0.01$.

Table 5. Characteristics of male and female swimmers, jumpers and controls

	Male			Female		
	controls (10)	swimmers (15)	jumpers (12)	controls (15)	swimmers (15)	jumpers (13)
Age (yr)	20.3 ± 1.6	19.5 ± 0.7	19.8 ± 1.3	20.2 ± 1.4	19.4 ± 1.0	19.9 ± 1.4
Height (cm)	176.1 ± 4.1	176.3 ± 4.5	178.2 ± 6.0	157.5 ± 4.2	163.9 ± 3.1*	166.4 ± 6.5*
Weight (kg)	67.3 ± 10.6	72.3 ± 4.9*	67.2 ± 3.7†	49.7 ± 4.0	57.1 ± 4.9*	56.3 ± 4.2*
Age at start of training (yr)		9.8 ± 1.9	12.8 ± 2.1†		7.6 ± 1.9	12.7 ± 1.5†
Training sessions per week (days)		6.0 ± 0.0	5.0 ± 0.0†		6.0 ± 0.0	5.0 ± 0.0†
Menarche (yr)				11.9 ± 1.4	12.9 ± 1.4	12.6 ± 1.1
Menstrual cycles per year				12.1 ± 0.8	11.8 ± 1.4	11.0 ± 3.2

Values are mean ± SD.

* vs control (multiple comparison by PLSD).

†vs swimmer (multiple comparison by PLSD).

Table 6. PQCT parameters of male and female participants' tibia

	Male			Female		
	controls (10)	swimmers (15)	jumpers (12)	controls (15)	swimmers (15)	jumpers (13)
Whole BMD (g/cm ³)	1.15 ± 0.12	1.08 ± 0.13	1.13 ± 0.13	1.29 ± 0.18	1.12 ± 0.16*	1.30 ± 0.22†
Cortical BMD (g/cm ³)	1.81 ± 0.10	1.79 ± 0.09	1.79 ± 0.06	2.00 ± 0.05	1.90 ± 0.08*	1.92 ± 0.12*
Cortical BMC (g/mm)	0.50 ± 0.04	0.49 ± 0.04	0.54 ± 0.04*†	0.36 ± 0.07	0.37 ± 0.04	0.47 ± 0.03*†
Periosteal Area (mm ²)	459.74 ± 50.12	483.21 ± 45.76	512.04 ± 55.02*	283.40 ± 52.41	340.86 ± 73.05*	378.31 ± 75.48*
Endocortical Area (mm ²)	184.67 ± 38.50	210.22 ± 42.17	208.86 ± 53.62	103.13 ± 29.17	148.02 ± 52.40*	135.25 ± 54.16
Cortical Area (mm ²)	275.07 ± 21.14	273.00 ± 22.15	303.18 ± 24.15*†	180.27 ± 35.64	192.83 ± 25.43	243.05 ± 24.38*†
(Size-adjusted values	275.07 ± 20.75	272.48 ± 22.25	302.89 ± 24.34*†)			
Cortical Thickness (mm)	4.456 ± 0.305	4.251 ± 0.438	4.657 ± 0.503†	3.804 ± 0.569	3.597 ± 0.328	4.497 ± 0.363*†
(Size-adjusted values	4.456 ± 0.288	4.224 ± 0.476	4.627 ± 0.570†	3.804 ± 0.563	3.555 ± 0.332	4.457 ± 0.378*†)
p-Moment of Inertia (mm ⁴)	10396 ± 1662	11062 ± 1731	12729 ± 2075*†	3920 ± 633	5789 ± 2179*	7661 ± 2397*†

Values are mean ± SD.

* vs control (multiple comparison by PLSD).

†vs swimmer (multiple comparison by PLSD).

Values in parenthesis are adjusted by height and weight.

Table 7. Characteristics of the subjects

	Male		Female	
	Control (7)	Jumper (10)	Control (8)	Jumper (7)
Age (yr)	20.3 ± 1.6	19.8 ± 1.3	21.6 ± 1.9	20.9 ± 1.0
Height (cm)	176 ± 4	178 ± 6	160 ± 2	166 ± 7
Weight (kg)	67.3 ± 10.6	67.2 ± 3.7	49.8 ± 4.3	56.8 ± 3.8*
Age at start of training (yr)		12.8 ± 2.1		13.3 ± 1.3
Training sessions (d/w)		5.0 ± 0.0		5.0 ± 0.0
Menarche (yr)			12.8 ± 1.4	12.7 ± 1.5
Menstrual cycles (per yr)			12.1 ± 0.4	10.9 ± 3.4*

Values are mean ± SD.

* $p < 0.05$.

Table 8. Two factor ANOVA

		Training history	Angle	Interaction
Periosteal radius	female	0.0001**	0.0001**	0.1973
	male	0.0001**	0.0001**	0.5133
Endoroctical radius	female	0.0270*	0.0001**	0.0001**
	male	0.0001**	0.0001**	0.0502
Cortical thickness	female	0.0001**	0.0001**	0.0001**
	male	0.0001**	0.0001**	0.0066**
Moment of inertia of area	female	0.0001**	0.0001**	0.9546
	male	0.0001**	0.0001**	0.9983
SSI	female	0.0001**	0.0001**	0.9404
	male	0.0001**	0.0001**	0.9472

* p<0.05, ** p<0.01.