CHARACTERISTICS OF BODY SEGMENT MASS DISTRIBUTIONS USING 3D ANTHROPOMETRY METHOD IN JAPANESE TOP MALE ATHLETE

[1] Noriko Hakamada , [2] Kazuo Funato, [1] Yuichi Hirano
[1] Japan Institute of Sports Sciences, Tokyo,
[2] Nippon Sport Science University, Tokyo, Japan;
email: noriko.hakamada@jpnsport.go.jp, web: http://naash.go.jp/jiss/

INTRODUCTION

The purposes of this study were to evaluate to body segment mass obtained from 3D whole body scanning anthropometry and to describe anthropometric characteristics in segment mass for Japanese male top athletes.

METHODS

Subjects were 13 Japanese top male athletes (5 gymnasts, age：23.0±3.0years, body height: 162.7±4.0cm, body mass: 55.0±2.4kg, 5 swimmers, age: 24.9±4.9years, body height: 180.5±3.3cm, body mass: 73.7±7.7kg, 3 wrestlers, age: 26.6±0.8years, body height: 166.6±2.7cm, body mass: 68.9±4.9kg) and 12 non-athletes (age: 23.8±1.5years, body height: 171.5±4.1cm, body mass: 68.7±6.1kg).

Whole body volume and each segmental volume were measured by using three dimensional whole body scanner (BLS: Hamamatsu Photonics KK) (Figure1).Whole body scanning data was divided into 14 segments in the same manner as the previous study done by C.E. Clauser,1969[1] according to anatomical landmark points (Figure2). Each segment mass (SM) by multiplying each segment volume and respective segment density reported by C.E. Clauser,1969[1] was calculated. Relative SM to whole body mass (%SM) was also calculated.

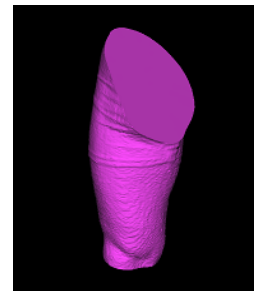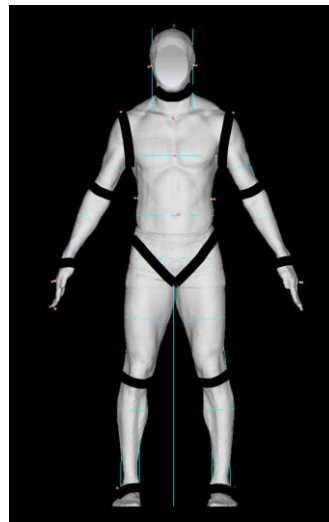**Figure 1** Scanning data obtained from 3D whole body scanning anthropometry

Figure2 Dissection of each segment divided into 14 segments (SM) in the same manner as the previous study done by C.E. Clauser,1969[1] and an example of right thigh segment .

RESULTS AND DISCUSSION

%Segment mass except for trunk and foot region were almost different among athletic groups.

All athletes had greater upper arm and smaller shank compared to non-athlete.

Gymnasts had significantly greater head+neck (8.50 ± 0.49%) and upper limb (upper arm: 3.20±0.07%, forearm: 2.02±0.06%, hand:0.70±0.04%) whereas smaller thigh. It was suggested that elite gymnasts were anthropometrically characterized as relatively large upper limb and smaller thigh as compared with other athletes.

Swimmer had significantly smaller forearm (1.69±0.09%), hand (0.57 ± 0.06%) and shank (4.42 ± 0.11%). Elite swimmers were characterized with thin down-tip structure in upper and lower limb.

Wrestler had greater thigh (13.14 ± 0.44%) and smaller head+neck (7.05 ± 0.66%). Wrestler could anthropometrically characterized as relatively larger thigh region.

CONCLUSIONS

Body segment structure in Japanese top athletes had specific anthropometric characteristics by different event, such that gymnast had greater upper limb, swimmer had a thin down-tip limb and wrestler had relatively large thigh region.

REFERENCES

1. Clauser C.E. , *AMRL technical report TR*:69-70,1969.

Table 1 %Segment mass obtained from gymnast, swimmer, wrestler and non-athlete (%).

	Gymnast(5)		Swimmer(5)		Wrestling(3)		non-athlete(12)		ANOVA	Tukey-Kramer HSD
	Mean	SD	Mean	SD	Mean	SD	Mean	SD		
Head+Neck	8.50	0.49	7.25	0.72	7.05	0.66	7.25	0.70	**	GM-NA,GM-SW,GM-WL
Trunk	44.69	0.31	45.60	0.82	44.30	0.90	44.98	1.98	n.s.	
Upper arm	3.20	0.07	3.06	0.12	3.01	0.09	2.72	0.17	***	NA-GM,NA-SW,NA-WL
Forearm	2.02	0.06	1.69	0.09	1.92	0.12	1.71	0.10	***	GM-NA,GM-SW,WL-NA,WL-SW
Hand	0.70	0.04	0.57	0.06	0.61	0.03	0.61	0.05	**	GM-NA,GM-SW
Thigh	11.77	0.37	12.64	0.28	13.14	0.44	12.91	0.66	**	GM-NA,GM-WL
Shank	4.46	0.08	4.42	0.11	4.47	0.24	4.80	0.32	*	SW-NA
Foot	1.25	0.10	1.21	0.17	1.17	0.09	1.14	0.12	n.s.	