Comparison of Architecture of Vastus Lateralis Muscle, Isokientic Muscular Strength and Skill-Related Fitness According to Sport-Specific Characteristics in Collegiate Athletes

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Introduction

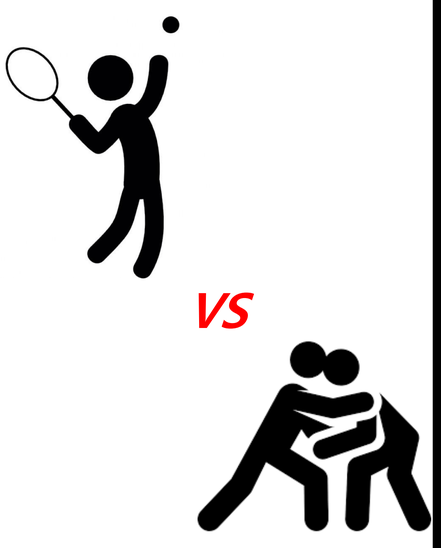
The vastus lateralis muscle is considered a representative quadriceps muscle since its architecture greatly influences the force-generating capacity and shortening velocity of the lower limbs (Alegre et al., 2005). Accordingly, its sport-specific characteristics include muscle strength and power and skill-related fitness (Bloomifield et al., 2007). Regarding the sport- or position-specific muscle architecture of athletes, Sporis et al. (2009) have reported results that can be used by coaches to improve training program development to maximize the fitness development. Therefore, it is important to identify the architecture of the vastus lateralis, muscle strength and skill-related fitness in terms of its sport-specific characteristics.

Purpose

The purpose of this study was to determine the comparsion effects of architecture of vastus lateralis muscle, isokinetic muscular strength and skill-related fitness according to sport-specific characteristics in collegiate athletes.

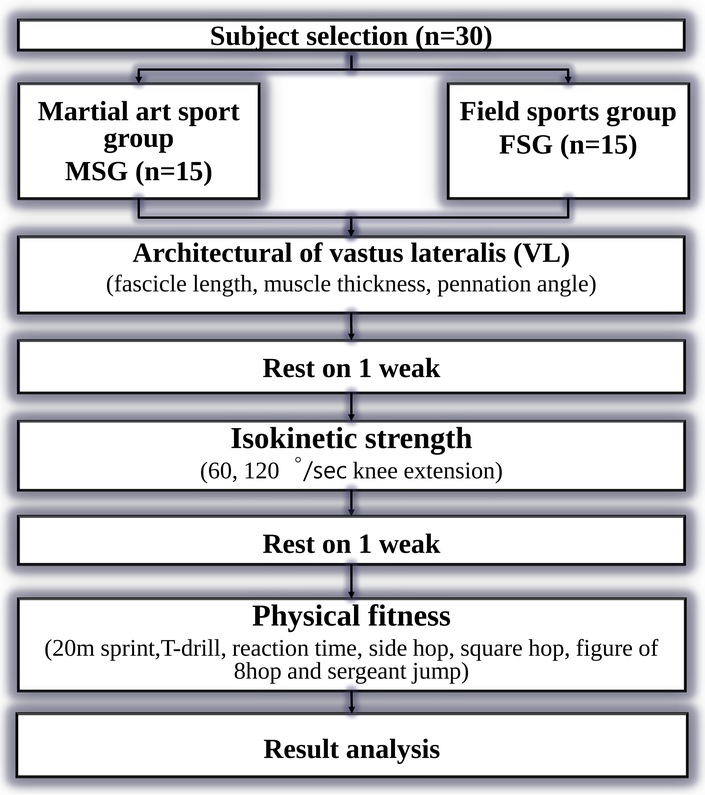
Methods

[Subjects]



- Thirty college athlete
- > 7 years of elite sports career
- Martial art sport group
  (kendo 7, wrestling 8, n=15)
- Field sports group
  (soccer 8, tennis 7, n=15)

[Study process]



Measurement

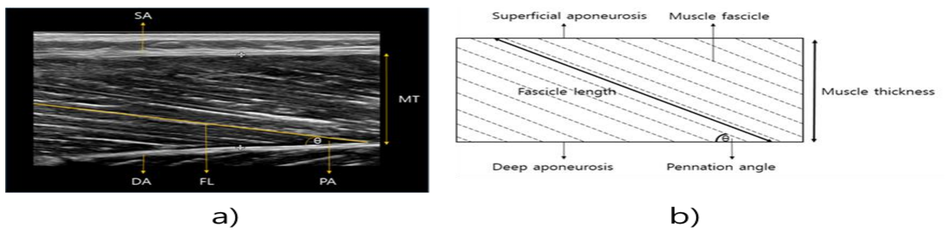
Architectural of VL

Ultrasound imaging

- **Supine position**
- **Knee full extension** (0°)
- **Vastus lateralis**
  (1/2 on the line from the greater trochanter of femur to the lateral epicondyle of femur)
- **Saggital plane, transverse plane**

(Amatachaya et el., 2010; Chen et al, 1991)

(EPIQ 7G, Philips, USA)



1. Muscle thickness : Distances between aponeroses measured at both ends of the scanned image

2. Pennation angle : The angle was measured as the angle between a fascicle and the deep aponeurosis

3. Fascicle length : Distance between the both ends of a fascicle at the aponeuroses → limitied

↓

Muscle thickness / sin (Fascicle angle)

(Alegre et al., 2006)

Isokinetic strength

- **Peak tourque, angle and peak torque, time to peak torque**
- **30 °/sec, 90 °/sec , 180 °/sec**
- **5 repeatition was performed and averaged**

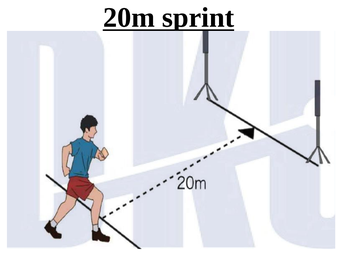
- **Sitting position**
- **Aligned by dynamometer and lateral epicondyle of femur**

(Bonetti et al., 2017)

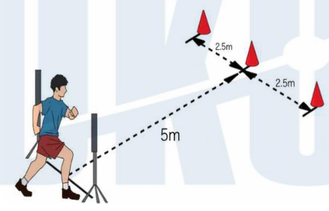
(Primus RS, BTE Tech, USA)

Physical fitness

20m sprint

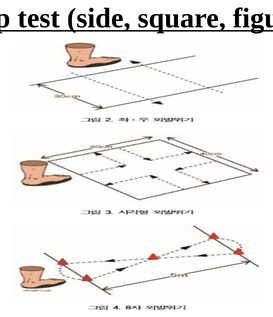


T-drill

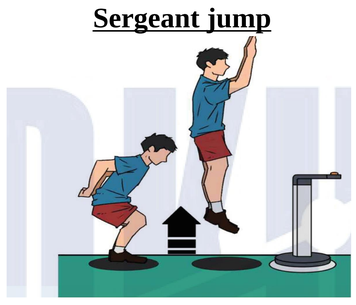


Reaction time

Hop test (side, square, figure 8)



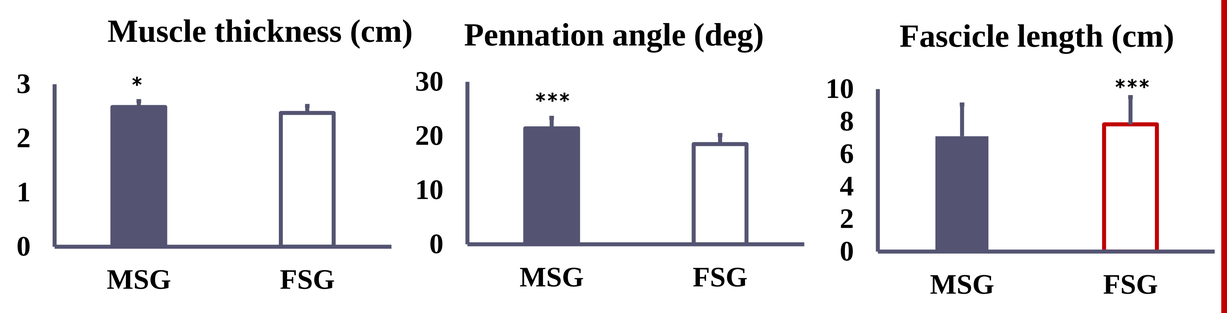
Sergeant jump



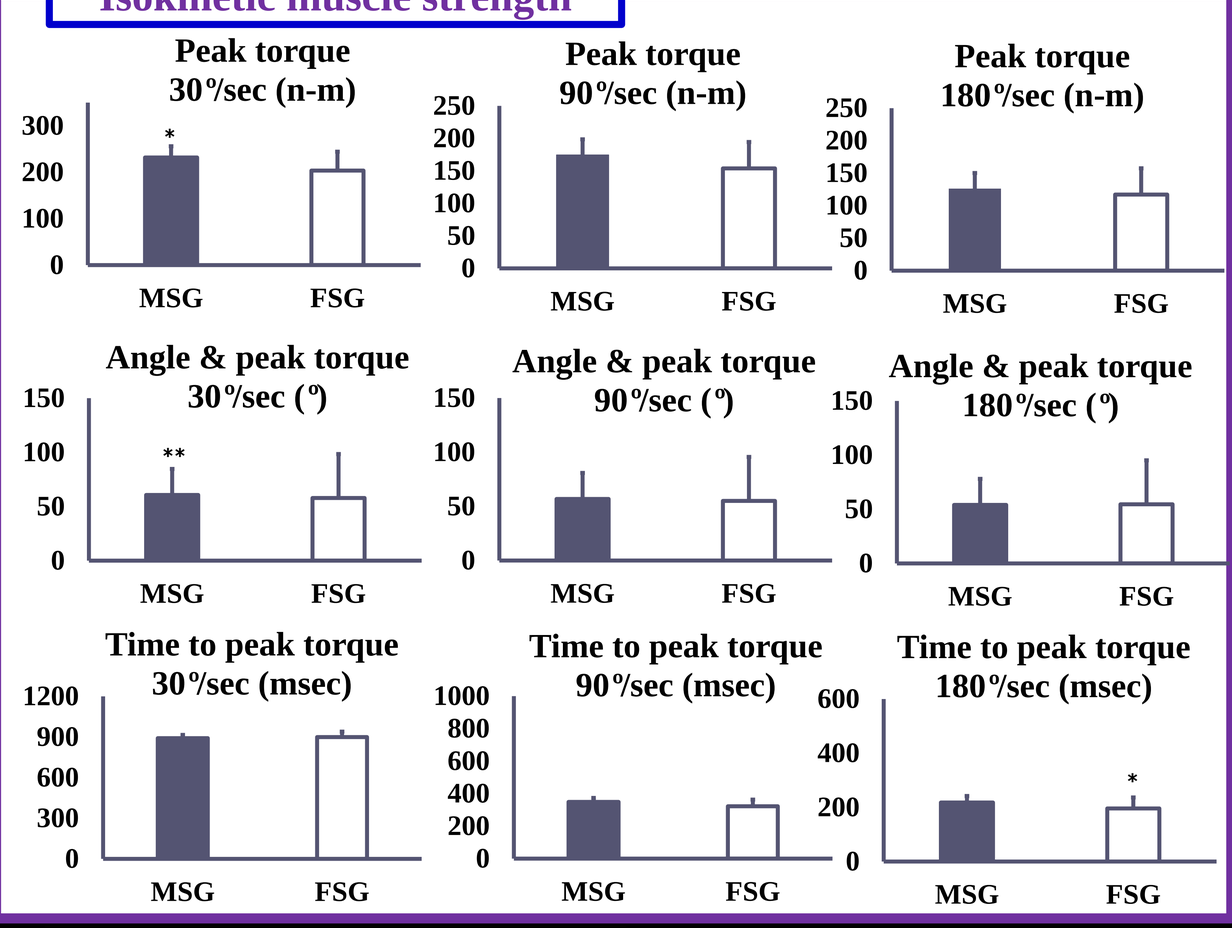
(Buchheit et al., 2012)

Result & Discussion

Architectural of VL



Isokinetic muscle strength



Physical fitness

Variables	MSG	FSG	*t*	*p*
20 m sprint	3.4 ± 0.14	3.2 ± 0.12	5.359	.001***
T-drill	7 .8 ± 0.40	6.8 ± 0.43	6.652	.001***
Reaction time	0.31 ± 0.03	0.28 ± 0.02	2.365	.025*
Hop test	8.28 ± 0.65	7.2 ± 0.82	3.876	.001***
	15.6 ± 0.83	14.1 ± 1.64	3.074	.005**
	4.8 ± 0.40	4.1 ± 0.18	5.793	.001***
Sergeant jump	45.1 ± 4.11	43.5 ± 2.48	1.327	.195

*Values are means ±SD. *p<.05, **p<.01, ***p<.001*

Conclusion

The present data indicate that among the architecture of the vastus lateralis muscle, the thickness and pennation angle are related to the maximum strength system of martial art sports athletes, whereas fascicle length is related to power and speed systems in field sports athletes.