THE INFLUENCE OF EXTERNAL ELASTIC COMPRESSION ON PERFORMANCE OF ISOKINETIC STRENGTH AND FATIGUE

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INTRODUCTION

In high-intensive competitions or leisure sports, the use of compressive garments (e.g., tights, pants, and suits) has become increasingly widespread with the need to reduce muscle injury and maintain muscle function (Trennell et al., 2006; Wallace, 2006). Mechanisms to explain the improved performance included changes in blood flow, improvement on muscle function and the damping of soft tissue vibrations (Herzog, 1993; Kraemer et al., 2001a; Nigg, 2008). Recently, there have been many publications demonstrating the benefits of compressive garments, however, few rigorous scientific studies have been conducted to make a detailed investigation into the performance under different compression conditions. The aim of this study was to compare the effects of two different external elastic compressions and a control condition on performance of muscle strength and fatigue in lower extremity.

METHODS

Eleven male subjects from Shanghai University of Sport were recruited for this experiment (age: 21.1±1.4, mass: 67.3±6.7 kg, height: 177.2±4.9 cm). Each participant had 4-5 years of experience in track and field specializing in sprint or jump. Testing utilized adjustable compressive wraps, which tension was obtained by the force-length curve. The three conditions of testing were: medium loads, high loads and control condition (no compression). The covered area was the whole thigh just above knee. Prior to the maximal testing, isometric muscular force was generated by maximal voluntary contractions (MVC) of the quadriceps muscles for 60° angles of knee flexion. Testing consisted of 1 set of 25 consecutive, maximal isokinetic knee extension movements at one of two randomly selected velocities (60° /s and 300 ° /s) on a calibrated Contrex Isokinetic System (CMV AG Corp. Switzerland).

The main variables discussed in this study for force production are peak torque, peak power and average power for the 1st five repetitions of knee extension, while for fatigue performances are total work and decaying ratio of torque. One-way ANOVAs were used for the statistical analysis. The level for significance was set at 0.05.

RESULTS AND DISCUSSION

The isokinetic results for force production (peak torque, peak power and average power) were shown in Table 1. No significant differences were found among control, medium and high external elastic compression at MVC and two angular velocities. As expected, each compression condition was significantly different among MVC, 60°/s and 300°/s.

The fatigue performance was evaluated and no significant differences were found between elastic compression and control condition (Figure 1). However, trends toward descended work and ascended k were observed in high loads compression at two angular velocities. That is to say, compared control with high loads, the total work of the latter one decreased approximately 4% both at 60°/s and 300°/s.

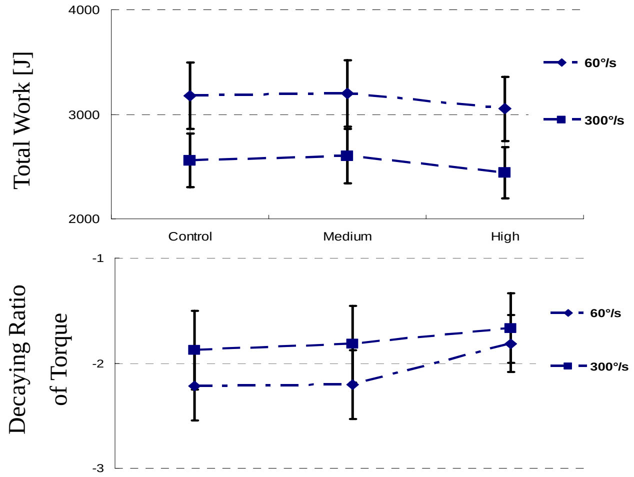

Figure 1: Influence of elastic compression conditions on the total work and decaying ratio of torque (k) for two angular velocities.

CONCLUSIONS

The results of this study indicate that local elastic compressive of lower extremity, while not significant improving isokinetic strength in short period, may have a positive effect on fatigue performance by helping maintain long-term power output. However, further work is needed to comprehend the benefits and mechanisms underlying the use of compression garments in athletes and healthy populations.

REFERENCES

1. Trennell MI, et al., *J Sports Sci Med*. 5:106–14, 2006.
2. Wallace L, et al., *Sports Coach*. 28:38–9, 2006

Table 1: Force production of knee extensors at MVC and two angular velocities. Values are mean ±*SD*

Knee Extension	MVC			60°/s			300°/s		
	Control	Medium	High	Control	Medium	High	Control	Medium	High
Peak Torque(Nm)	223.0±*37*	212.8±*35*	213.6±*35*	175.7±*30*	179.1±*35*	174.4±*23*	140.0±*30*	140.6±*22*	130.7±*29*
Peak Power(W)				182.7±*32*	186.7±*38*	181.6±*25*	616.0±*88*	614.4±*89*	590.5±*98*
Ave. Power (W)				107.4±*14*	110.2±*20*	103.7±*18*	233.9±*36*	238.3±*27*	231.1±*45*