THE EFFECTS OF DIFFERENT EXTERNAL ELASTIC COMPRESSION ON THE AMPLITUDE OF EMG AND MMG

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INTRODUCTION

Compression suits and compression wearing have become more popular and worldwide as competitive sport garments, leisure activity apparels and therapeutic intervention. Manufacturers also claimed that wearing compression garments may help athletes improve performance and alleviate fatigue in sports (Houghton et al., 2007). 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 researches demonstrated the benefits of compression suits, but fewer rigorous scientific studies have been conducted to make a detailed investigation into the amplitude of EMG and MMG when wearing different compression suits. The purpose of this study was to examine the amplitude of EMG and MMG of the rectus femoris on three compression conditions and trying to find the appropriate pressure range for performance improving.

METHODS

Amateur (N=12) athletes were recruited for this study. The amplitude of EMG and MMG of the rectus femoris (RF) under wearing different compression elastic textile were recorded by using DASYLAB software, while each participate was conducting 5 consecutive isokinetic maximal concentric muscle action of the dominant leg extensors at two selected velocities (60°s^{-1} and 300 °s^{-1}) on a calibrate Con-trex system dynameters.

Prior to testing, the external elastic textile, which tension is obtained by the force-length curve was done. The three formal conditions of testing were: medium loads, high loads and control condition (no compression). The area which the external elastic textile covered was on the rectus femoris (RF) for one circle.

Date analysis was performed with custom programs written with DASYLAB software. For each of 5 repetitions, the EMG and MMG amplitude (RMS) were calculated over the middle third of each repetition based on a total range of motion of 90° (approximately a 30°range of motion;0.5s for 60°s^{-1} and 0.1°s^{-1} for 300°s^{-1}). The MMG signal was bandpass filtered from 10 to 100 Hz and EMG signal was bandpass filtered from 10 to 700 Hz prior to signal analysis.

RESULTS AND DISCUSSION

The results were presented in Table 1. No significant differences were found in amplitude (RMS) of EMG and MMG at 60°s^{-1}, but at 300°s^{-1}, there were significant differences between control condition and medium load. The medium loads compression condition showed an increase in EMG and MMG ($p<0.05$) when compared to the control condition.

Results above indicated that if the compression and velocity of locomotion could not reach a certain range，the effect of external elastic textile may not as distinct as we considered before. Meanwhile, compared with no or high compression in local area, medium loads had a better ability of recruiting more motor units in helping improve performance.

CONCLUSIONS

The results showed that the external elastic textile increased the muscle activity of RF at 300°s^{-1}, while not significantly influencing the amplitude of EMG and MMG of RF at knee extension speed 60°s^{-1} in short period. The appropriate external elastic compression may have a positive effect on performance at 300°s^{-1} by helping RF recruiting additional motor units in high-velocity. There may be muscle-specific difference in the MMG amplitude responses with the external elastic textile during maximal concentric isokinetic muscle action. However, further study should investigate optimal loads (press or compression) for different muscle for compression garments and examine the mechanism of the effects of compression garments used for athletes.

REFERENCES

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Table 1: The RMS of EMG and MMG for the RF under three loads at 60°s^{-1} and 300°s^{-1}

RMS	60°s^{-1}			300°s^{-1}		
	Control	**Medium**	**High**	**Control**	**Medium**	**High**
EMG (mv)	0.4829±0.2989	0.4530±0.2441	0.4326±0.2320	0.6497±0.2065	0.7942±0.2758*	0.5596±0.1673
MMG (m/s^2)	0.4584±0.1105	0.3291±0.0626	0.3525±0.0695	0.6567±0.3015	0.9108±0.3226#	0.7909±0.3561

* and # indicate a significant difference compared with control condition, $p<0.05$.