

DO SPORT COMPRESSION STOCKINGS IMPROVE COMFORT AND ACCELEROMETRY PARAMETERS IN RUNNERS?

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In this study, we analysed accelerometry data from runners foot strikes with and without sport compression stockings. Also, we measured comfort perceived with these garments due its importance to a succesful performance. Ten male runners (n=10) exerted two laboratory test condition in different days: a) without compression stockings and b) with one kind of compression in each leg. Accelerometry data were registered using sensors in tibia and head. Also participants filled out a comfort test in stockings' condition. Medium compression (MC) impacts attenuation was lower than no compression (NC) condition ($p<0,05$). General comfort perceived was 66%. In conclusion, compression stockings demonstrated a protective effect against impacts and were perceived as comfortable.

KEY WORDS: compressive stockings, impacts, comfort, running

INTRODUCTION: Comfort perception is an important parameter in sport performance (Kolcaba & Steiner, 2000). Thereby, an improve in comfort of compressive stockings could lead to a better performance. Thus, when there's an introduction of a sport garment is necessary to evaluate its effectiveness and has been demonstrated that a positive perceived comfort is necessary to success in the use of these garments in runners' performance (Lucas-Cuevas et al., 2014). Other authors like Mündermann et al. (2003) also found comfort as an important and relevant feature of garments like foot orthoses cause its effects in kinematic, kinetic and EMG variables in recreational runners. Every time the foot strikes to the ground, has placed a fast deceleration which is transmitted from foot to head (Whittle, 1999). These impacts may lead to overuse injuries (Whittle, 1999). Thus, minimize this body deceleration is interesting due to its relation with injuries, performance (Mercer et al., 2002) and comfort (Kolcaba & Steiner, 2000). So if comfort is important for a successful introduction of any sports garment, we should to take it in account for our study to understand better if can be related with accelerometry variables in runners. Hence, the aim of our study was to measure perception of comfort and strike deceleration using different running compression stockings (different compression grade) in runners.

METHODS: Ten male runners (n=10; 35±5 years; 40±10km/week) performed two laboratory running tests: one without stockings and another one with one kind of compression stocking (medium and strong) in each leg (randomized). The running test consisted in 35 minutes (5 minutes warm up at 8km/h and 30 minutes at the 75% of their maximal aerobic speed, measured previously in an incremental running test) and was performed in a treadmill in laboratory conditions. Garments were fitted according to manufacturer's guidelines (to choose correct sizes), and runners were instrumented with accelerometry sensors in tibia and head through which we record accelerometry data samples during 15 seconds every 5 minutes along the test looking for effects due to fatigue. Also, runners filled out a visual scale of perceived comfort before and after the test with compression stockings. In this scale there were different items related with comfort like perceived temperature in stockings' area or garments' fitting. SPSS was used to statistical analysis, using normality tests, ANOVA and post-hoc Bonferroni to check differences between conditions.

RESULTS: Both compressive garments obtained better values of perceived comfort, reaching a general comfort of 66%. Perceived temperature in sport compressive area and use of stockings in summer were the items less valued for runners. Regarding impacts attenuation, there were significant differences ($p=0.003$) between medium compression and no compression conditions ($28.876\pm 7,110\%$ vs $47.504\pm 8,052\%$). Not statistically significant differences were found between stockings conditions. We also didn't find significant relation between strikes' attenuation and fatigue.

DISCUSSION: Previous studies also found beneficial results in perceived comfort by the use of compression garments (Lucas-Cuevas et al, 2014). This is necessary for a successful introduction of sport garments due its relation with performance (Kolcaba & Steiner, 2000).

In relation to accelerometry data, we didn't found much significant differences, probably because we need more samples, but we could notice a tendency by which there's a "protective effect" induced by compression stockings (Lucas-Cuevas et al, 2014), cause less attenuation in stockings condition was achieved, what means less impact is transmitted from tibia to the head. Also is possible could be needed to choose runners with similar strike pattern (rearfoot, midfoot or forefoot strike) to reduce deviations in accelerometry data, because in our study we choose runners with similar performance but we notice differences in accelerometry data due to kinematics, though we didn't measure kinematic data we observed quite much differences in running technique. We suggest future studies regarding how different kind of compression stockings may lead, or not, to differences in impacts attenuation and also longer and more realistic conditions of fatigue like running endurance events like 10k or half-marathon.

CONCLUSION: The use of sport compression stockings improve comfort perception but a worse sensation by raised temperature in stockings' area. Irrespective compression grade, stockings demonstrated a protective effect during running due to better attenuation of impacts.

REFERENCES:

- Kolcaba K & Steiner R. (2000). Empirical evidence for the nature of holistic comfort. *Journal of Holistic Nursing: Official Journal of the American Holistic Nurses' Association*, 18(1), 46–62.
- Lucas-Cuevas AG, Pérez-Soriano P, Llana-Belloch S, Macián-Romero C, Sánchez-Zuriaga D. (2014) Effect of custom-made and prefabricated insoles on plantar loading parameters during running with and without fatigue. *Journal of Sports Sciences* ; 32: 1712-1721
- Mercer JA, Vance J, Hreljac A, Hamill J. (2002) Relationship between shock attenuation and stride length during running at diferent velocities. *Eur J Appl Physiol*; 87: 403-408
- Mündermann A, Nigg BM, Humble RN, Stefanyshyn DJ. (2003) Orthotic comfort is related to kinematics, kinetics, and EMG in recreational runners. *Medicine & Science in Sports & Exercise*; 10: 1710-1719
- Whittle MW. (1999) Generation and attenuation of transient impulsive forces beneath the foot: a review. *Gait Posture*; 10: 264-275