

Effects of forearm compression sleeves for recovery of finger flexor muscles in sports climbing

Mirjam Limmer^{*12}, Markus de Marées², and Ralf Roth¹

¹ Institute of Outdoor Sports and Environmental Science, German Sports University Cologne, Cologne, Germany

² Department of Sports Medicine and Sports Nutrition, Ruhr-University Bochum, Bochum, Germany

Introduction

Wearing compression garments is a commonly used intervention in sports in attempt to improve performance and facilitate recovery. There is evidence that compression garments are effective in enhancing recovery from muscle damage. Forearm compression may improve muscle tissue oxygenation in finger flexor muscles and, therewith, enhance recovery processes after exhausting sports climbing. However, evidence on the effect of compression garments on recovery in sports climbing is still lacking. Therefore, the purpose of this study was to evaluate immediate effects of wearing forearm compression sleeves during an exhausting sports climbing task and a subsequent 2 h recovery period on muscular strength and endurance of finger flexor muscles in sports climbers.

Method

In a randomized controlled trial with a parallel group design, thirty sports climbers (female: $n = 15$; male: $n = 15$) performed first a familiarization trial and subsequently a test trial either with compression forearm sleeves (COMP), non-compressive placebo forearm sleeves (PLAC), or without forearm sleeves (CON). Test trials consisted of the performance measurements *intermittent hand grip strength* and *intermittent finger hang* before (PRE) and after a combination of lap climbing until exhaustion and a following two hours resting recovery period (POST). Creatine kinase (CK) was used as a physiological stress parameter. Additionally, maximum blood lactate (La_{max}), maximum heart rate (HR_{max}), rate of perceived exertion (BORG scale), and forearm muscle pain (VAS scale) were determined directly after the exhaustive lap climbing trials. We further assessed the lactate clearing rate (CR) as well as the perceived recovery status (PRS scale) during the resting recovery period.

Results

The exhaustive lap climbing followed by two hours of a resting recovery period resulted in significantly lower performance in the sports climbing-specific *intermittent finger hang* test, represented by the maximal number of repetitions (PRE: 23.2 ± 16.0 , POST: 18.8 ± 11.3 ; $p \leq 0.001$, $d = 6.826$) and the time to failure (PRE: 281.6 ± 193.6 , POST: 224.8 ± 135.6 s; $p \leq 0.001$, $d = 80.053$). We also found higher CK values after the lap climbing plus following recovery period (PRE: 241.1 ± 273.2 , POST: 318.4 ± 332.0 U/L; $p = 0.010$, $d = 172.727$), but none of the climbing-unspecific *intermittent hand grip strength* measurements were affected. Additionally, no group differences between conditions (COMP, PLAC, CON) occurred, neither for any of the performance parameters in *intermittent hand grip strength* and *intermittent finger hang* tests, nor for CK, La_{max} , CR or the BORG, VAS, and PRS scales ($p \leq 0.05$). The only difference between conditions was found for HR_{max} ($p = 0.010$, $\eta_p^2 = 0.395$) during lap climbing,

* Presenting author

Attending author(s)

with lower values occurring in CON (133.6 ± 13.1) compared to COMP (157.1 ± 12.0) and PLAC (153.7 ± 15.3 bpm).

Discussion

Forearm compression sleeves and placebo sleeves resulted in higher maximum heart rates during exhaustive lap climbing, potentially confirming an increase of heart rate due to compression garments and heat (placebo sleeves) reported in earlier studies. However, wearing forearm compression sleeves during exercise and recovery did neither enhance sports climbing-specific *intermittent finger hang* task nor climbing-unspecific *intermittent hand grip strength* parameters, physiological responses or perceptual measures subsequently. These findings suggest that the use of forearm compression garments may not improve recovery processes in recreational sports climbers after a lap climbing performance task to exhaustion.

References

- [1] Engel, F. A., Sperlich, B., Stöcker, U., Wolf, P., Schöffl, V., & Donath, L. (2018). Acute Responses to Forearm Compression of Blood Lactate Accumulation, Heart Rate, Perceived Exertion, and Muscle Pain in Elite Climbers. *Frontiers in Physiology* 9: 605. <https://doi.org/10.3389/fphys.2018.00605>
- [2] Hill, J., Howatson, G., van Someren, K., Leeder, J., & Pedlar, C. (2014). Compression garments and recovery from exercise-induced muscle damage: a meta-analysis. *British Journal of Sports Medicine* 48(18): 1340–1346. <https://doi.org/10.1136/bjsports-2013-092456>
- [3] Leoz-Abaurrea, I., Santos-Concejero, J., Grobler, L., Engelbrecht, L., & Aguado-Jiménez, R. (2016). Running Performance While Wearing a Heat Dissipating Compression Garment in Male Recreational Runners. *Journal of strength and conditioning research* 30(12): 3367–3372. <https://doi.org/10.1519/JSC.0000000000001467>
- [4] Limmer, M., de Marées, M., & Roth, R. (2022). Effects of Forearm Compression Sleeves on Muscle Hemodynamics and Muscular Strength and Endurance Parameters in Sports Climbing: A Randomized, Controlled Crossover Trial. *Frontiers in Physiology* 13: 888860. <https://doi.org/10.3389/fphys.2022.888860>

Short Biography

Mirjam Limmer currently works at the Institute of Outdoor Sports and Environmental Science at the German Sport University Cologne. She is a sports scientist, an IVBV certified mountain guide, and serves as division chief of mountain sports and sports climbing in education and research at her university. Her primary research interests include Outdoor Sports, Sports Physiology, Environmental Physiology and Sports Nutrition. Currently, her research focuses on various recovery methods to enhance sports climbing performance as well as on nutritional aspects for an improvement of exercise performance at altitude, and the influence of altitude on cognitive aspects. She can be contacted at m.limmer@dshs-koeln.de.