Title: Application of blood flow restriction by a sport training of climbers – an innovative training method for sportsmen?

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Abstract: The most common injuries of performance climbers include tendon injuries of finger flexors. This kind of injury can leave a sportsman unable to follow his training programme for several months, which can have a crucial impact on his peak season. The thesis comprised a comparison of a high-intensity training performed at 70% of muscle strength maximum, with a blood flow restriction training performed at a 30% muscle load, and also the physiological and functional aspects of the training.

Objectives: The presumption is, that the combination of a low muscle load with an ischemy will achieve the same results as a high-intensity training. We also presume, that the alterations in muscle oxygenation remain the same despite different amounts of performed muscle work.

Methods: 13 participants finished the experiment performed in the form of a crossover study. During the experiment the muscle oxidative capacity and the extent of the muscle deoxygenation were measured by spectroscopy. The maximum force, critical force, impulse and the impulse above the critical force point were measured and stated using the 1D-SAC system.

Results: After the onset of the high-intensity training protocol, following changes were observed: maximum force - -2.6 N ± 54.8 N; critical force - -4.5 N ± 27.9 N; impulse - -99.6 Ns ± 424.3 Ns, impulse above the critical force point - 20.7 Ns ± 297.8 Ns; muscle oxygenation index after an occlusion - 7.5 s ± 29.9 s; muscle oxygenation index after an “all-out“ test - 0.3 s ± 6.5 s; muscle oxygenation index during an “all-out“ test - -2.7 mMol ± 10 mMol

After the onset of the blood-flow restriction training protocol, following changes were observed: maximum force - -13 N ± 29.4 N; critical force - -9.9 N ± 33.1 N; impulse - -160.3 Ns ± 352.5 Ns, impulse above the critical force point - 23.6 Ns ± 325.5 Ns; muscle oxygenation index after an occlusion - -4.5 s ± 23.6 s; muscle oxygenation index after an “all-out“ test -0.6 s ± 5.3 s; muscle oxygenation index during an “all-out“ test - 2.3 mMol ± 10.9 mMol

Conclusion: We presume, that a high-intensity training, by which a high muscle load but a low metabolic load occur, is comparable with a low-intensity training, which is however accompanied by a high metabolic load caused by an incomplete ischemy of the exercised externity. However, to make a valid conclusion further experimental research which would eliminate the impact of limiting factors with the potential to influence the final results is necessary, since the stated results showed neither statistical singificance nor severe influence of the group size according to kohen D.

Keywords: HIT - high intensity training, muscle oxygenation, muscle, muscle fibre type I and II, physiological stress, incomplete ischemy