

**低強度血流制限下での筋力トレーニングが、
血管機能に及ぼす影響
—血管内皮機能と動脈硬化指標の関連—**

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**Impact of Low Intensity Resistance Training
with Blood Flow Restriction on Vascular Function
-The Relation between Endothelial Function and Arteriosclerosis-**

by

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ABSTRACT

This study investigated impact of low intensity resistance training with blood flow restriction (BFR) on vascular function. In total, 20 healthy male subjects participated in this study and they were divided into two groups, i.e., high intensity resistance training group without BFR (HIT) and low intensity resistance training with BFR group. Each group performed resistance training, i.e., double leg extension, for three days/week, and it lasted for four weeks. The training of HIT consisted of 10 reps*3sets at the intensity of 75% of maximal voluntary contraction (MVC), and that of BFR was 30 reps+15 reps*3 sets at 30%MVC. After four weeks training period, muscle strength was significantly increased in both groups ($p<0.05$, respectively) with no differences in

changing rate between groups. An indicator of arteriosclerosis assessed by cardio ankle vascular index (CAVI) was significantly improved in only BFR group ($p<0.05$) but no changes in HIT. Ankle systolic blood pressure (aSBP) was significantly decreased improved after training period in only BFR group ($p<0.05$), while blood pressure at arm remained unchanged in both groups. In addition, changes in aSBP was related to changes in CAVI ($r=0.685$, $n=20$, $p<0.05$). Endothelial function at popliteal artery evaluated by flow mediate dilation slightly improved in BFR without no significant improvement. In addition, basal diameter and peak diameter during reactive hyperemia in BFR group were also slightly increased with no significant difference, but, it did not change in HIT training group. These results suggested that low intensity resistance training with BFR may improve vascular function, and this improvement may be partly depend on changes in aSBP.

要 旨

低強度血流制限下での筋力とレーニングが血管機能に及ぼす影響について成人男性を対象に検討した。高強度血流制限なしのトレーニング群（HIT 群, $n=10$ ）と低強度血流制限ありのトレーニング群（BFR 群, $n=10$ ）は週 3 日の頻度で、4 週間両脚伸展運動を行った。HIT 群は最大筋力の 75% 強度で 10 回 3 セットを、BFR 群は、30% 強度で、30 回 +15 回 \times 3 セット（合計 75 回）の運動をそれぞれ行い、これを 1 日のトレーニングとした。両群ともトレーニング介入により、最大筋力は有意に増大したが、群間の差はなかった。足首の収縮期血圧および動脈硬化指標の一つである心臓足首血管指数（CAVI）は BFR 群のみ有意な改善効果が認められた。さらに、足首の収縮期血圧の変化量と CAVI の変化量の間に有意な相関関係が認められた。一方、膝窩動脈で評価された血管内皮機能は、全身の動脈硬化指標の改善結果を一部支持するにとどまった。以上のことから、低強度血流制限下での筋力トレーニングは、血管機能を改善させる可能性が示唆された。さらに、動脈スティフネスの改善度は、足首の血圧の低下に