THE ACUTE EFFECTS AND RELIABILITY OF BLOOD FLOW RESTRICTED MAXIMAL STRENGTH TESTING

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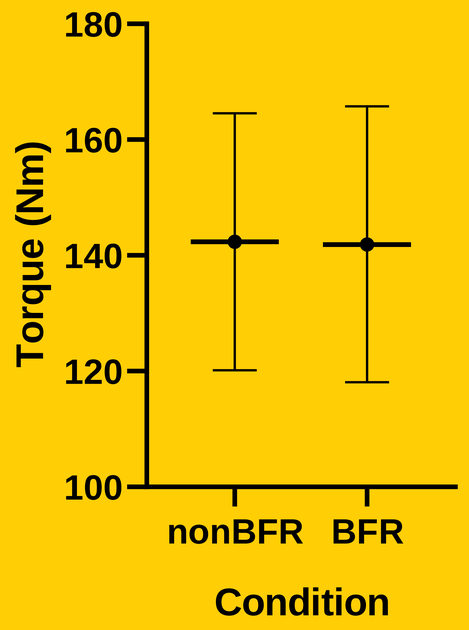
Background

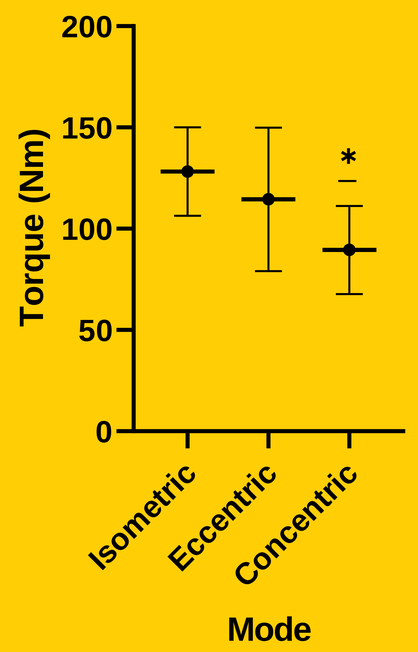
The general recommendation for blood flow restriction (BFR) exercise suggests using an arterial occlusion pressure (AOP) of 40-80%. For BFR protocols, training load is typically prescribed relative to maximal strength under non-restricted conditions. BFR at a high AOP (>100%) may acutely increase maximal strength, but the effect of a commonly used moderate AOP on maximal strength is not known. Therefore, the purpose of this study was to examine the acute effects of BFR applied at 60% of AOP on maximal strength.

Methods

Eleven (mean age ± SD; 21.4 ± 1.3 years) females who regularly (at least 2x/week for the past 6 months) performed resistance exercise completed maximal unilateral isometric and concentric leg extension muscle actions using their dominant leg with and without BFR. Participants visited the laboratory twice to complete three repetitions of each muscle action, both with and without BFR (six randomized sets of three repetitions each visit). For each set, the highest torque value produced was used for further analyses. Test-retest reliability for concentric, eccentric, and isometric maximal strength was assessed between visits and the model 2,1 was used to calculate the intraclass correlation coefficients (ICC). A 2(Condition [BFR, no BFR]) x 2 (Visit [1, 2]) x 3 (Mode [Concentric, Eccentric, Isometric]) repeated measures ANOVA was used to examine mean differences in maximal strength.

BFR at 60% TAOP **does not affect maximal strength** and maximal strength **testing with BFR is reliable** across visits.





Variables	*Visit 1*	*Visit 2*	*P* Value	ICC	$ICC_{95\%}$	SEM	MD	Grand Mean
CON BFR, Nm	87.04 ± 21.35	91.71 ± 24.09	0.399	0.705	0.235-0.910	12.34	34.21	89.38
CON noBFR, Nm	88.54 ± 21.55	90.83 ± 20.25	0.610	0.775	0.358-0.934	9.91	27.48	89.69
ISO BFR, Nm	126.83 ± 22.27	128.92 ± 26.27	0.697	0.763	0.327-0.931	11.82	32.75	127.88
ISO noBFR, Nm	126.79 ± 15.26	130.17 ± 23.48	0.539	0.619	0.063-0.881	11.96	33.14	128.48
ECC BFR, Nm	116.88 ± 31.55	114.50 ± 36.88	0.787	0.677	0.145-0.902	19.44	53.90	115.69
ECC noBFR, Nm	115.83 ± 36.84	110.87 ± 36.23	0.424	0.858	0.571-0.959	13.77	38.16	113.35

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Results

There were no mean differences between visits (p > 0.05) for any of the variables and the ICC values among all variables ranged from 0.619 - 0.858. There were no significant interactions (p = 0.281-.804; η_p^2 = 0.022 - 0.0119) or main effects for Visit (p = 0.861; η_p^2 = 0.003) or Condition (p = 0.663; η_p^2 = 0.020). There was, however, a significant (p = 0.001; η_p^2 = 0.582) main effect for Mode (Concentric = 89.3 ± 22.3 Nm; Eccentric = 114.5 ± 35.4 Nm; Isometric = 128.5 ± 22.7 Nm) (p<0.001–0.041).

Conclusion

The application of BFR at 60% of AOP did not augment or attenuate concentric, eccentric, or isometric maximal strength assessments. Furthermore, both BFR and non-BFR maximal strength testing can be assessed reliably between visits.

Practical Application

The acute application of BFR using a moderate AOP does not affect assessments of maximal strength. Thus, clinicians and practitioners who have limited time with their athletes may assess maximal strength under restricted or un-restricted conditions when it precedes exercise and/or rehabilitation strategies. Furthermore, trainers, clinicians, and researchers can prescribe exercise interventions relative to a restricted (when using a moderate AOP) or non-restricted assessment of maximal strength.

References

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