Supplementary Materials

Blood Flow Restriction Training and its use in Rehabilitation after Anterior Cruciate Ligament Reconstruction: A Systematic Review and Meta-analysis

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Table S1: Data collection table for study characteristics

To include:

- Study authors
- Year of publication
- Country of origin
- Type of occlusion used
- Study size (number of participants in both arms)
- Gender distribution across both arms
- Average age of participants
- Length of rehabilitation
- Length of follow up / dates at which participants had data recorded

Authors	Year Published	Country	Occlusion Type	N number	Gender	Participant Age/years	Length of rehabilitation/ weeks	Timing of data collection after initial evaluation/ weeks
Jack et al	2022	USA	Delfi Medical automated torniquet at 80% arterial limb occlusion pressure around proximal thigh	Control – 17 BFR - 15	Control – M7/F8 BFR – M12/F5	Control – 24.1 (+-7.2) BFR – 28.1 (+-7.2)	12 weeks (biweekly sessions) (beginning within 7 days post op)	8- and 12-weeks from beginning training
Hughes et al	2019	UK	Delfi Medical automated torniquet at 80% arterial limb occlusion pressure around proximal thigh	Heavy Load Resistance Training – 14 BFR - 14	Heavy Load Resistance Training – M10/F2 BFR – M7/F5	Heavy Load Resistance Training – 29 (+-7) BFR – 29(+-7)	8 weeks (biweekly sessions) (beginning at 2 weeks post op)	9 weeks from the beginning of training
De Melo et al	2022	Brazil	Cuff Scientific Leg® – WCS 80% arterial limb occlusion	Control – 12 BFR - 12	Control – M9/F3 BFR – M8/F4	Control – 39.6 (+-10.8) BFR – 41.1 (+-9.8)	12 weeks (biweekly sessions)	4/8/12 weeks post op

			pressure around proximal thigh					
Li et al	2023	China	Air band Bluetooth pressurized device at 40% occlusion pressure and 80% occlusion pressure	Control – 6 40% BFR – 9 80% BFR - 8	Gender split across groups was not provided	18-40 years old but the specific split was not detailed	8 weeks (biweekly session) (beginning at least 8 weeks post op)	8 weeks from the beginning of training
Kacin et al	2021	Slovenia	BFR GROUP Double-chamber pneumatic cuff with asymmetric pressure Ischemic Trainer inflated to 150mmHg SHAM BFR GROUP Double-chamber pneumatic cuff with asymmetric pressure Ischemic Trainer inflated to 20mmHg	Control – 6 20mmHg BFR – 6 150mmHg BFR - 6	Control – M3/F3 20mmHg BFR – M3/F3 150mmHg BFR – M3/F3	Control – 36(+-9) 20mmHg BFR – 38(+-8) 150mmHg BFR – 38(+-6)	3 weeks (3 sessions a week)	3 weeks from the beginning of training
Ohta et al	2003		Air torniquet at 180mmHg Worn around proximal thigh	Control – 22 BFR - 22	Control – M12/F20 BFR – M13/F9	Control – 30(+-9.7) BFR – 28 (+-9.7)	16 weeks (6 times weekly with different exercises throughout the program)	16 weeks from surgery

Jung et al	2022	Korea	Not stated	Control – 12 BFR - 12	Control – M9/F3 BFR – M9/F3	Control – 27.83(+-8.43) BFR – 30.83(+-7.59)	12 weeks beginning 3 days post op (3 times a week with different exercises throughout the program)	12 weeks and 2 days from the beginning of training
Iversen et al	2015	Norway	Delphi low pressure cuff with pressure starting at 130mmHg and rising to 180mmHg by 10th day of training	Control – 12 BFR - 12	Control – M7/F5 BFR – M7/F5	Control – 29.8(+-9.3) BFR – 24.9(+-7.4)	14 days with occlusion if in intervention group + 2 days without stimulus Beginning at 2 days post-surgery (2 times a day)	16 days post-surgery

Table S2: Data collection table for primary outcomes

To include:

- Author
- Number of patients in the control
- Number of patients in the intervention
- Primary outcome and how it was measured
- Primary outcome results for control group (mean and standard deviation)
- Primary outcome results for intervention group (mean and standard deviation)
- P value (actual p value if given)

Table S2.1 : Primary outcome of interest: Changes in femur/thigh muscle mass

Author	Control (N)	Intervention (R)	Way outcome was measured	Control Results	Intervention Results	P value
Jack et al (6 weeks)	17	15	DEXA scan of thigh, change in lean mass / kg	-0.27 (0.03)	-0.09 (0.03)	<0.01
(12 weeks)				-0.12 (0.05)	0.00 (0.03)	<0.01
Hughes et al	14	14	USS of vastus lateralis, change in muscle thickness/cm	1.94 (0.44)	1.91 (0.39)	0.85
De Melo et al	12	12	Not recorded	Not recorded	Not recorded	Not recorded
Li et al	6	40% BFR – 9 80% BFR - 8	Muscle thickness/cm	4.32 (0.7)	40% BFR – 5.23 (0.84) 80% BFR – 6.26 (0.64)	N vs 40% BFR <0.05 (0.017) N vs 80% BFR <0.05 (0.000) 40% vs 80% <0.05 (0.004)
Kacin et al	6	20mmHg BFR – 6 150mmHg BFR - 6	Muscle size (cross sectional area of quadriceps)/mm2	Not reported	20mmHg BFR: -1.1(2.1%) 150mmHg BFR: 5.0 (3%)	20mmHg vs 150mmHg <0.01
Ohta et al	22	22				
Jung et al	12	12	Not recorded	Not recorded	Not recorded	Not recorded

Iversen et al	12	12	Cross sectional area of femur 40% from knee joint/cm2 Cross sectional area of femur 50% from knee joint/cm2	40%: - 9.2(0.8) 50%: - 11.5 (0.7) Mean Change: -13.1(1.0)	40%: -9.7(1.0) 50%: - 13.7(0.9) Mean Change: -13.8(1.1)	0.6265

Table S2.2 : Primary outcome of interest: Changes in Leg Strength (flexion and extension)

Author	Control (N)	Intervention (R)	Way outcome was measured	Control Results	Intervention Results	P value
Jack et al (8 weeks)	17	15	Single leg leg press/kg	58.6(8.0)	59.3(10.0)	Not reported as not significant
(12 weeks)				76.5(9.0)	72.7(8.7)	Not reported as not significant
Jack et al (8 weeks)			Single leg hamstring curl/kg	29.9(5.1)	28.2(4.2)	Not reported as not significant
(12 weeks)				38.5(4.5)	37.7(4.9)	Not reported as not significant
Hughes et al	14	14	Isokinetic strength 60°/s flexion	Unable to determine	Unable to determine	Unable to determine
			Isokinetic strength 60°/s extension	Unable to determine	Unable to determine	0.20
			Isokinetic strength 150°/s flexion	Unable to determine	Unable to determine	Raw values not provided
			Isokinetic strength 150°/s extension	Unable to determine	Unable to determine	<0.01
			Isokinetic strength 300°/s flexion	Unable to determine	Unable to determine	Unable to determine
			Isokinetic strength 300°/s extension	Unable to determine	Unable to determine	<0.01
De Melo et al (4 weeks	12	12	Knee extension/N	≈12	≈15	Not reported as not significant
			Knee flexion/N	≈7	≈8	Not reported as not significant

(8 weeks)			Knee extension/N	≈13	≈17	Not reported as not significant
			Knee flexion/N	≈8 (unable to determine s.d)	≈10 (unable to determine s.d)	<0.01
(12 weeks)			Knee extension/N	≈14 (unable to determine s.d)	≈20 (unable to determine s.d)	<0.01
			Knee flexion/N	≈9 (unable to determine s.d)	≈13 (unable to determine s.d)	<0.01
Li et al	6	40% BFR – 9 80% BFR - 8	Combined knee flexion and extension/N/Kg 60°/s	Before: 90.20 (21.53) After: 94.05 (17.62) Δ 3.58	40% BFR: Before: 93.02 (46.61) After: 123.94 (28.13) Δ 30.92 80% BFR: Before: 107.53 (46.75) After: 152.04 (25.45) Δ 44.51	N vs 40% BFR <0.05 (0.030) N vs 80% BFR <0.05 (0.000) 40% vs 80% <0.05 (0.027)
			Combined knee flexion and extension/N/Kg 180°/s	Before: 70.98 (15.07) After: 73.28 (15.73) Δ 2.3	40% BFR: Before: 74.72 (39.93) After: 102.06 (17.34) Δ 27.33 80% BFR: Before: 78.69 (34.47) After: 137.65 (25.54) Δ 58.96	N vs 40% BFR <0.05 (0.013) N vs 80% BFR <0.05 (0.000) 40% vs 80% <0.05 (0.001)
Kacin et al	6	20mmHg BFR – 6 150mmHg BFR - 6	Extensor muscles Peak torque 60 °/s (Nm)	Not reported	20mmHg BFR: 147 (52) 150mmHg BFR: 171 (64)	<0.05 (0.018)
			Flexor muscles Peak torque 60 °/s (Nm)	Not reported	20mmHg BFR: 97 (0.731) 150mmHg BFR: 117 (33)	0.731
			Extensor muscles Peak torque 120 °/s (Nm)	Not reported	20mmHg BFR: 121 (44) 150mmHg BFR: 139 (48)	<0.05 (0.027)

			Flexor muscles Peak torque 120 °/s (Nm)	Not reported	20mmHg BFR: 84(20) 150mmHg BFR: 100 (24)	0.172
Ohta et al	22	22				
Jung et al	12	12	Extensor muscles Peak torque 60 °/s (Nm)	Before: 121.70 (44.48) After: 139.42 (48.06) Δ 17.72	Before: 94.08 (35.89) After: 131.08 (47.23) Δ 37.00	0.279
			Flexor muscles Peak torque 60 °/s (Nm)	Before :66.43 (22.90) After: 72.10 (18.22) Δ 5.67	Before: 53.17 (22.25) After: 80.50 (23.73) Δ 27.33	<0.05 (0.006)
Iversen et al	12	12	Not measured	Not measured	Not measured	Not measured

Table S3: Data collection table for secondary outcomes

To include:

- Author
- Number of patients in control
- Number of patients in intervention
- Secondary outcomes of the paper and how they were measured
- Secondary outcomes of control group (mean and standard deviation)
- Secondary outcome results of intervention group (mean and standard deviation)
- P value (actual P value if given)
- Using only Lysholm and IKDC as more specific to functioning and sports

Table S3.1 : Secondary outcome of interest: Lysholm Score

Author	Control (N)	Intervention (N)	Secondary outcomes	Control results	Intervention results	P value
Jack et al	17	15	Not Measured			
Hughes et al	14	14	Lysholm Score	Before: 111.83 (14.44) After: 91.92 (14.42)	Before: 115.42 (16.58) After: 93.93 (14.04)	Before: 0.58 After: 0.73
De Melo et al (4 weeks	12	12	Lysholm Score	81.75 (3.80)	92.00 (2.39)	
(8 weeks)				86.17 (1.95)	100.00 (0)	<0.05
(12 weeks)				90.58 (0,84)	100,00 (0)	<0.05
Li et al	6	40% BFR – 9 80% BFR - 8	Not measured			
Kacin et al	6	20mmHg BFR – 6 150mmHg BFR - 6	Not measured			
Ohta et al	22	22	Not measured			
Jung et al	12	12	Lysholm Score	Before: 69.17 (11.94) After: 83.08 (6.32) Δ 13.92	Before: 63.67 (21.82) After: 86.50 (12.27) Δ 22.83	0.158
Iversen et al	12	12	Not measured			

Table S3.2 : Secondary outcome of interest: IKDC score

Author	Control (N)	Intervention (N)	Secondary outcomes	Control results	Intervention results	P value
Jack et al	17	15	Not Measured			
Hughes et al	14	14	IKDC	Before: 48.33 (10.30) After: 30.17 (9.31)	Before: 48.59 (16.71) After: 32.03 (10.34)	Before: 0.96 After: 0.65
De Melo et al (4 weeks	12	12	IKDC	51.58 (2.02)	58.25 (1.50)	
(8 weeks)				55.00 (1.6)	65.08 (0.38)	<0.05
(12 weeks)				60.92 (1.59)	74.83 (0.44)	<0.05
Li et al	6	40% BFR – 9 80% BFR - 8	IKDC	Before: 58.50 (13.32) After: 59.00 (10.79) Δ 0.5	40% BFR: Before: 57.44 (14.03) After: 65.11 (10.65) Δ 7.67 80% BFR: Before: 55.75 (12.13) After: 75.38 (10.45) Δ 19.63	N vs 40% BFR 0.295 N vs 80% BFR <0.05 (0.000) 40% vs 80% <0.05 (0.001)
Kacin et al	6	20mmHg BFR – 6 150mmHg BFR - 6	Not measured			
Ohta et al	22	22	Not measured			
Jung et al	12	12	IKDC	Before: 62.36 (14.11) After: 75.25 (9.94) Δ 10.86	Before: 59.55 (12.04) After: 76.42 (14.32) Δ 16.87	0.290
Iversen et al	12	12	Not measured			