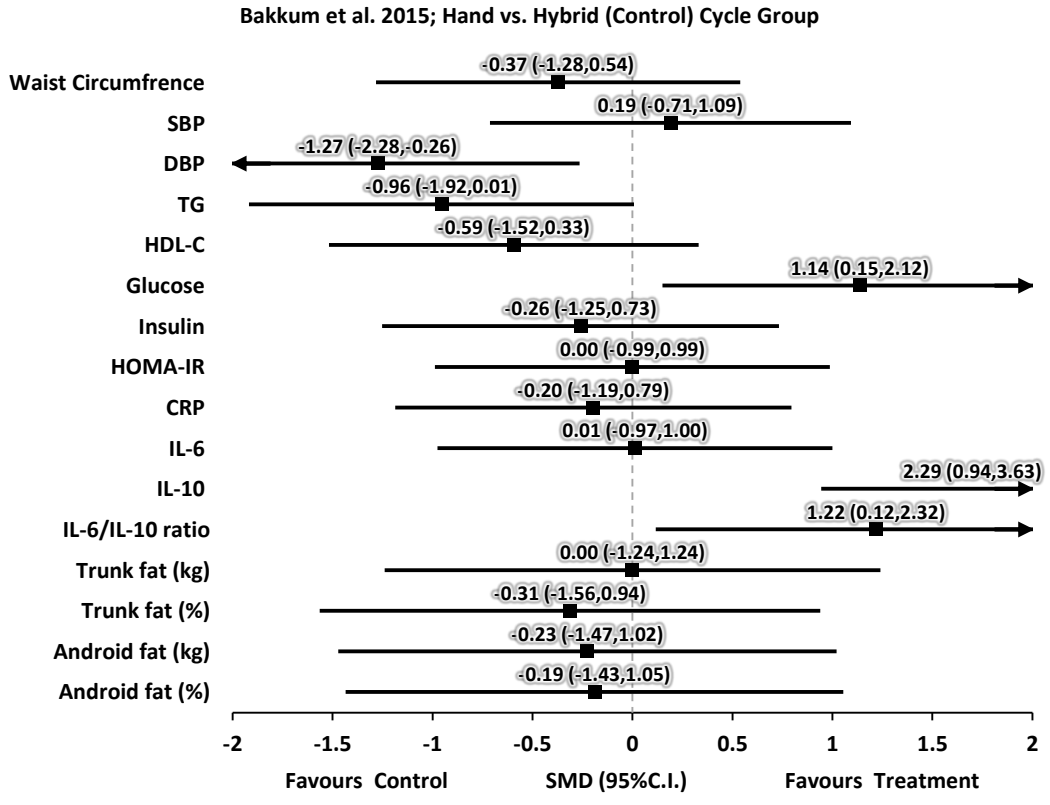
Author, Year; Country Score Research Design Sample Size	Methods	Outcomes
Bakkum et al. 2015 Netherlands PEDro =6 RCT Level 1 N=19	**Population:** 19 participants (18 males, 1 female, C2-L2) with SCI for more than 10 years. **Treatment:** Participants were randomized to the hybrid or hand cycle group**.** 9 participants on hybrid cycle and 10 participants on hand cycle during 32 individual training sessions within a period of 16 weeks. The duration of each training session increased from 18 to 32 minutes during the program. **Outcome Measures:** Metabolic syndrome (waist circumference, systolic/diastolic blood pressure, high density lipoprotein cholesterol, triglycerides, and insulin resistance), inflammatory status (C-reactive protein, interleukin -6 & -10), and visceral adiposity (trunk and android fat).	1. For all metabolic components, inflammatory markers, and visceral adiposity, there were no differences over time between the 2 training groups. 2. Overall reductions were found for waist circumference, diastolic blood pressure, insulin resistance, CRP, IL-6, trunk and android fat percentage.
	Effect Sizes: Forest plot of standardized mean differences (SMD ± 95%C.I.) as calculated from pre- and post-intervention data 	

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Brurok et al. 2011; Norway Pre-Post Level 4 N = 6	**Population:** 6 men with SCI in stable neurologic recovery (5 participants – paraplegic AIS A, 1 participant – tetraplegic AIS A) **Treatment:** Aerobic high-intensity hybrid exercise training 3X/week for 8 wks preceded by a 7-wk control period of regular daily activity. Peak tests were performed at three different time points: 1, baseline; 2, control; and 3, post-training. **Outcome measures:** peak stroke volume during hybrid cycling and peak oxygen consumption during hybrid cycling, arm cycle ergometry, and FES leg cycling.	1. Between the control and post training test, there was a significant increase in Hybrid VO2 peak (25.3%) and VO2Peak during arm cycle ergometry (25.9%), and VO2 Peak during FES cycle (25.8%).
Thijssen et al. 2006; The Netherlands Pre-post Level 4 N = 9	**Population:** 8 males, 1 female, C5-T12, 8 complete AIS A, 1 incomplete AIS C, age 39 yrs, 11 yrs post-injury. **Treatment:** Simultaneous FES cycle ergometry and arm ergometry, 25 min/d, 2 d/wk, 6 wks followed by 6-wks detraining. **Outcome Measures:** Blood flow of thigh, diameter of the femoral artery and flow-mediated dilation.	1. After 2 wks of training, there was a significant increase in baseline and peak blood flow, an increase in femoral artery diameter, and a decrease in femoral artery flow-mediated dilation. 2. Detraining lead to a reversal of baseline and peak thigh blood flow, vascular resistance, and femoral diameter. 3. Detraining did not restore femoral artery flow mediated dilation.
Thijssen et al. 2005; The Netherlands Pre-post Level 4 N = 10	**Population:** 9 males, 1 female, T1-T12, 9 complete, age 39.2 yrs, 1–20 yrs post-injury. **Treatment:** Simultaneous FES cycle ergometry and arm ergometry, 30 min/d, 2–3 d/wk, 4 wks. **Outcome Measures:** VO_2peak, blood flow and vascular resistance, and echo Doppler (diameter and flow-mediated dilation after 13 min of ischemia).	1. Training resulted in increased thigh resting (43.5%) and peak blood flow (17.1%), decreased thigh resting vascular resistance (31.8%), and increased femoral artery diameter. 2. After training, there was an increase in maximal workload (6.8%), VO_2peak (6.1%), and resistance to fatigue.
Gurney et al. 1998; USA Pre-post Level 4 N = 6	**Population:** All male, C4-T10, 4 paraplegia, 2 tetraplegia, ages 23–41 yrs, 5–24 yrs post-injury. **Treatment:** Phase I: FES leg cycle, 3 d/wk, 6 wks; Phase II: FES leg cycle with simultaneous, voluntary arm ergometry, 3 d/wk, 6 wks; Phase III: 8-wks detraining. **Outcome Measures:** VO_2peak, submaximal and maximal HR.	1. Increased VO_2peak (81.7%) and workload with FES leg cycle. 2. After an 8-wk detraining period, peak workload returned to baseline; VO_2peak remained higher.
Mutton et al. 1997; USA Pre-post Level 4 N = 11	**Population:** All male, complete AIS A, C5-6 to T12-L1, age 35.6 yrs, 9.7 yrs post-injury. **Treatment:** 3 phases of exercise training (FES leg-cycle ergometry). Phase I progressive FES leg-cycle exercise to 30 min of exercise; Phase II ~35 sessions of FES-leg cycle ergometry; and Phase III ~41 sessions (30 min each) of combined FES-leg and arm ergometry. **Outcome Measures:** VO_2peak and submaximal physiological parameters (VO_2, HR, blood lactate).	1. In response to FES-leg cycle ergometry training both VO_2peak and peak work rate during graded FES leg exercise (but not graded arm ergometry) testing improved. 2. With hybrid training, VO_2peak (13%) and peak power output (28%) were increased during graded hybrid testing, but not during graded arm or graded FES leg testing alone.
Krauss et al. 1993; USA Pre-post Level 4 N = 8	**Population:** 7 male, 1 female, 7 paraplegia, 1 tetraplegia, age 32 yrs, 13 yrs post-injury. **Treatment:** 2 phase program. Phase I: FES leg cycling 3 d/wk, 6 wks; Phase II: FES leg cycle plus simultaneous arm ergometry for 6 wks.	1. After Phase I, arm ergometer VO_2peak (21.9%) and FES leg ergometer VO_2peak (62.7%) increased. 2. After Phase II, the hybrid exercise VO_2peak increased 13.7%.

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	Outcome Measures: VO_2peak, HR, workload, peak lactate.	3. Peak HR only increased with training during FES leg ergometry.
Pollack et al. 1989; USA Pre-post Level 4 N = 11	**Population:** 7 male and 4 female, C4-C6 and T2-T6, complete motor lesions, ages 18–54 yrs, 6–132 months post-injury. **Treatment:** 3 phase program over 13–28 wks. Phase I: quadriceps stimulation (knee extension); Phase II: FES leg cycle with 0–1 kp resistance; Phase III: loaded FES leg cycle, 3 d/wk, 3 wks. **Outcome Measures:** BP, HR, oxygen consumption.	1. There were significant increases in endurance time (288%), VO_2peak (95.9%), and HR (16.8%) and decreases in diastolic BP (31.5%) with training.
Bakkum et al. 2014 Netherlands Cross-sectional study Level 5 N=9	**Population:** Nine individuals (8 males, 1 female, mean age of 40) with motor complete paraplegia or tetraplegia (6 AIS A, 4 AIS C) **Treatment:** In Session 1, participants performed two 5 minute bouts of Hybrid Cycling at Rate of Perceived Exertions 3 (Light-Moderate) and 6 (Moderate-Vigorous). Hybrid cycling combines handcycling with FES-induced leg cycling. After 48-72 hours of rest, the same participants completed the exact same protocol but with Hand Cycling. **Outcome Measures:** Metabolic rate, cardiorespiratory response (heart rate, oxygen pulse, ventilation)	1. Metabolic rate was higher during hybrid cycling than during hand cycling at equal perceived exertion levels. 2. When compared to Hand Cycling, heart rate and ventilation were higher during hybrid cycling, while oxygen pulse was the same. 3. Heart rate also varied by perceived exercise intensity.