SDC 1: Effect of exercise training on cardiac, autonomic and cardiometabolic outcomes in SCI with low-CVRF

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Authors, date** | **Training** | **n** | **Age (yr)** | **TSI (yr)** | **Level of injury** | **Methods / VO2 testing** | **Main outcomes** | **Baseline value** | **Changes after training** |
| ***VO2peak and Fitness*** |
| ***Cervical injuries*** |  |  |  |  |  |  |  |  |  |
| **Mohr, 1997**[**28**](#_ENREF_28) | FES-cycling | 10 | 27 - 45 | 3–23 | C6-T4 | Uncontrolled study | Peak VO2, L/min | 1.20 ± 0.08 | ↑23%, *P* < .05 |
|  |  |  |  |  | ASIA A-C | 52 wk 3x/wk, 30' | Peak PO, W | 4 ± 1 | ↑ 425% |
|  |  |  |  |  |  | Testing: FES-cycling ergometer | Peak lactate | 9.0 ± 1.2 | NS ↑ up to 11.8 ± 0.9 |
|  |   |  |   |   |   |   | MHC isoform IIA | 33% | ↑ 61% |
| **Hjeltnes, 1998**[**30**](#_ENREF_30) | Arm cycling | 10 | 25 ± 2 | < 0.5 | C6-C8 | Case -controlled study | Peak VO2, L/min - Cervical | 0.78 ± 0.07 | No changes in Cervicals |
|  |  | 10 | 31 ± 4 | < 0.5 | T7 - T11 | Arm cycling | Peak VO2, L/min - Thoracic | 1.37 ± 0.08 | ↑ 28%, *P* < .001 |
|  |  |  |  |  | ASIA A-B | 12-16 wk 3x/wk, 30' | Peak PO, W | 22 ± 2 | ↑ 45%, *P* < .01 |
|  |  |  |  |  |  | Testing: Arm crank ergometer | Peak HR, bpm | 110 ± 5 | No changes |
|  |  |  |  |  |  |  | Peak Lactate, mmol/L | 5.86 ± 1.32 | No changes |
| **Janssen, 2008**[**31**](#_ENREF_31) | FES-cycling | 12 | 36 ± 16 | 11 ± 9 | C4-T11 | Uncontrolled study | Peak VO2, L/min | 0.81 ± 0.28 | NS ↑ 30% |
|  |  |  |  |  | ASIA A-C | 6 wk 3x/wk, 30' | Peak PO, W | 8.6 ± 9.9 | ↑56% |
|  |  |  |  |  |  | Interval training | Peak HR, bpm | 97.4 ± 11.2 | NS ↑ to 113.3 ± 23.0 |
|  |  |  |  |  |  | Testing: FES-cycling ergometer | Peak VE, L/min | 41.3 ± 12.3 | NS ↑ to 49.1 ± 9.1 |
|  |  |  |  |  |  |  | Peak CO, L/min | 8.6 ± 1.9 | NS ↑ to 9.5 ± 2.3 |
|  |   |  |   |   |   |   | Peak lactate, mmol/L | 6.6 ± 1.9 | NS ↑ to 8.7 ± 1.0 |
| **Qiu, 2016**[**57**](#_ENREF_57) | FES rowing | 12 | 33 ± 4 | 8 ± 3 | C4 – T2 | Uncontrolled study | Peak VO2 ,mL/min/kg | 15.3 ± 1.5 | ↑ 12% (*P* = .02) |
|  |  |  |  |  |  | 24 wk 2-3x/wk, 75%, 30' | Peak PO, W | 34.6 ± 4.4 | ↑ 28% (*P* < .01) |
|  |  |  |  |  |  | Testing: FES-rowing | Peak VE, L/min | 37.5± 4.4 | tendency *P* = .09 |
|  |  |  |  |  |  |  | Peak HR, bpm |  | No changes |
|  |  |  |  |  |  |  | RER |  | No changes |
|  |   |  |   |   |   |   | R. Peak VO2 vs. Peak VE | R2 = 0.62 | ↑ to r2 = 0.84 |
| **Wouda, 2018**[**33**](#_ENREF_33) | Treadmill-85-95% | 10 | 50 ± 15 | < 0.5 | 7C/1T/2L | Randomized controlled trial | Peak VO2, L/min | 2.70 ± 0.81 | ↑ ~10% no ≠ btw gps |
|  | Treadmill 70% | 10 | 34 ± 15 | < 0.5 | 4C/4T/2L | 12 wk, 2x/wk, 35' vs. 45' | 6MWD, m | 561 ± 93 | ↑ ~15% no ≠ btw gps |
|  | Usual care | 10 | 41 ± 19 | < 0.5 | 7C/2T/2L | Testing: Treadmill | Daily energy expenditure, KJ | 2666 ± 528 | No changes |
|   |   |   |   |   | ASIA C-D |   |   |  |   |
|  |   |  |   |   |   |   | Peak lactate, mmol/L | 6.6 ± 1.9 | NS ↑ to 8.7 ± 1.0 |
| ***Thoracic injuries*** |  |  |  |  |  |  |  |  |
| **Valent, 2009**[**51**](#_ENREF_51) | Hand cycle | 35 | 42 ± 14 | < 0.5 | T1-T12 | Cohort study | Peak VO2, Para, L/min | 1.10 ± 0.23 | ↑29% vs. bsl |
|  | Control | 56 | 40 ± 15 | < 0.5 | T1-T12 | 20-30 wk, 1-3/wk, 20-30' | Peak VO2 Para – Cont. | 1.22 ± 0.48 | ↑7% vs. bsl |
|  | Hand cycle | 20 | 33 ± 10 | < 0.5 | C5-C8 | Testing: Wheelchair treadmill | Peak VO2 Tetra, L/min | 0.86 ± 0.32 | No changes |
|  | Control | 26 | 44 ± 14 | < 0.5 | C5-C8  |   | Peak VO2 Tetra – Cont. | 0.97 ± 0.38 | No changes |
| **Tordi, 2001**[**29**](#_ENREF_29) | Wheelchair | 5 | 27 ± 8.1 | ~ 2 | T6-L4 | Uncontrolled study | Peak VO2 , mL/kg/min | 21 (17 - 33) | ↑18.5% |
|  |  |  |  |  | ASIA A | 4 wk 3x/wk, 30' | Peak PO, W | 45 (35 - 45) | ↑27.9% |
|  |  |  |  |  |  | interval training | Peak HR, bpm | 176 | ↓ 5% |
|  |   |  |   |   |   | Testing: Wheelchair treadmill | Peak VE, L/min | 64 (47 - 78) | No changes |
| *Cardiac structure and function* |
| ***Cervical injuries*** |  |  |  |  |  |  |  |  |  |
| **Nash, 1991**[**35**](#_ENREF_35) | NMES Quad | 8 | 28 ± 5 | 6 ± 3 | C5-C7 | Uncontrolled study | LV internal dimension, mm | 48.9 ± 3.4 | ↑ 6.5% (*P* <·02) |
|  | + FES-cycling |  |  |  | ASIA A | 24 wk, 3/wk, 30’ | ISWT, mm | 7.5 ± 1.3 | ↑ 18% (*P* <·002) |
|  |  |  |  |  |  | Echocardiography | Posterior wall thickness, mm | 7.4 ± 1.2 | ↑ 20% (*P* <.01) |
|  |   |   |   |   |   |  End-diastolic measurements |  |  |  |
| **Hooker, 1992**[**34**](#_ENREF_34) | FES-cycling | 18 | 30 ± 2 | 6 ± 1 | C4-T11 | Uncontrolled study | Peak VO2, L/min | 0.78 ± 0.05 | ↑ 23% *P* < .05 |
|  |  |  |  |  |  | 12-16 wk, 2/3x/wk, 10-30’  | Peak CO, L/min | 8.5 ± 0.5 | ↑ 13% *P* < .05 |
|  |  |  |  |  |  | Impedance cardiography | Total peripheral resistance, mmHg/L/min | 11.3 ± 0.9 | ↓ 14% *P* < .05 |
|  |   |   |   |   |   |  | Peak VE, L/min | 28.1 ± 1.2 |  ↑ 27% *P* < .05 |
| **Taylor, 1993**[**36**](#_ENREF_36) | NMES + stand ES | 7 | 27 ± 7 | 2 ± 1 | C5-T12 | Uncontrolled study | Resting CO mL/min resting? | 4360 ± 2790 | NS ↑ to 5230 ± 1750 |
|  |  |  |  |  |  | 3 mo program | Thigh blood flow mL/min | 167 ± 70 | ↑ 115% *P* < .001 |
|  |  |  |  |  |  | 300 ms, 20 Hz, up to 150mA | Quadriceps depth, mm | 14.5 ± 4.2 | ↑ 70% *P* < .001 |
|  |  |  |  |  |  | Impedance cardiography | Subcutaneous fat,  | 15.9 ± 4.4 | NS ↑ to 17 ± 4 |
| **Hjeltnes, 1998**[**30**](#_ENREF_30) | Arm cycling | 10 | 25 ± 2 | < 0.5 | C6-C8 | Case controlled study | Peak VO2, L/min - Cervical | 0.78 ± 0.07 | No changes in Cervicals |
|  |  | 10 | 31 ± 4 | < 0.5 | T7 - T11 | Arm cycling | Peak VO2, L/min - Thoracic | 1.37 ± 0.08 | ↑ 28%, *P* <.001 |
|  |  |  |  |  |  | CO2-rebreathing method | Submax CO - Cervical | 5.5 ± 0.6 | NS ↑ to 6.8 ± 1.2 |
|  |  |  |  |  |  |  | Submax CO - Thoracic | 7.3 ± 0.4 | No changes |
|  |  |  |  |  |  |  | Submax SV - Cervical | 50 ± 4 | NS ↑ to 69 ± 14 |
|  |   |  |   |   |   |   | Submax SV - Thoracic | 52 ± 4 | No changes |
| **D.E. Rossi, 2014**[**68**](#_ENREF_68) | Sedentary | 29 | 31 ± 1 | 7 ± 1 | C4-T12 | Cross-sectional analysis | SV, mL | 61.2 ± 2.3 | > 15% in athletes, *P* < .05 |
|  | Athletes | 29 | 29 ± 1 | 9 ± 1 | C4-T12 | > 1 yr sport practice | LV end-diastolic diameter, mm | 44.6 ± 0.7 | > 7% in athletes, *P* < .05 |
|  |  |  |  |  | ASIA A/B | Echocardiography | LV end-systolic diameter, mm | 28.0 ± 0.6 | > 8% in athletes, *P* < .05 |
| **Gibbons, 2016**[**58**](#_ENREF_58) | FES-rowing | 5 | 32 ± 5 | 7 ± 7 | C4-T10 | Uncontrolled study | VO2peak, L/min | 0.97 ± 0.22 | ↑ 11%, *P* < .05 |
|  |  |  |  |  | ASIA A-B | 8 wk, 3/wk, 30' | Peak HR, bpm | 151 ± 7 | ↑ 8%, *P* < .05 |
|  |  |  |  |  |  | Doppler | LV mass, g | 110 ± 6 | ↑ 7%, *P* < .05 |
|  |  |  |  |  |  | Echocardiography | EDV, mL | 65 ± 8 | ↑ 40% *P* < .05 |
|  |  |  |  |  |  |  | ESV, mL | 28 ± 5 | ↑ 25%, *P* < .05 |
|  |  |  |  |  |  |  | Diastolic function (E/A) | 1.38 ± 0.05 | ↑ 9%, *P* < .05 |
| ***Thoracic injuries*** |  |  |  |  |  |  |  |  |
| **Gates, 2002\***[**67**](#_ENREF_67) | Power | 11 | 25 ± 7 | 5-24 | T1-T10 | Cross-sectional analysis | Wall thickness, cm | 0.83 ± 0.10 | Tend to ↑ in whole group |
|  | Endurance | 10 | 30 ± 9 | 8-18 | T4-L1 | Doppler | LV mass, g | 164 ± 66 | Tend to ↑ in whole group |
|  | Sedentary | 5 | 29 ± 6 | 3-16 | T1-T4 | Echocardiography |   |  | no ≠ between groups |
| **Maggioni, 2012**[**64**](#_ENREF_64) | Endurance | 10 | 33 ± 7 | NA | T1–L1 | Cross-sectional analysis | VO2peak, mL/kg/min | 13.3 ± 3.3 | > 61% in trained, *P* = .001 |
|  | Untrained | 7 | 36 ± 10 |  | T1–L3 | 5 yr / 3-5h /wk | IVST, mm | 8.6 ± 0.8 | >18% in trained, *P* = .01 |
|  |  |  |  |  | ASIA A | Echocardiography | posterior wall thickness, mm | 8.4 ± 1.1 | NS ≠ in trained |
|   |  |  |  |  |  |  | LV mass, g/m2 | 56.3 ± 17.5 | > 48% in trained, *P* = .01 |
|  |   |   |   |   |   |   | E/A ratio | 1.64 ± 0.80 | NS ≠ in trained |
| *Autonomic function* |
| **Bloomfield, 1994**[**39**](#_ENREF_39) | FES-cycling | 7 | 28 ± 2 | 5 ± 1 | C5-T7 | Uncontrolled study | VO2peak, L/min | 0.72 ± 0.1 | No changes |
|  |  |  |  |  |  | Catecholamine | Resting EPI pmol/L | 163 ± 32 | ↓ 80%, *P* < .05 |
|  |  |  |  |  |  |  | Exercise NE pmol/L | 1350 ± 610 | No changes |
|  |  |  |   |   |   |  | Exercise EPI pmol/L | 510 ± 293 | No changes |
| **Ditor, JAP 2005**[**37**](#_ENREF_37) | BWSTT | 8 | 27.6 | 9.6 ± 7.5 | C4–C5 | Uncontrolled study | HR bpm | 61.9 ± 6.9 | ↓10%, *P* < .05 |
|  |  |  |  |  | ASIA B-C | 24 wk, 3x/wk, 15' | LF HRV (0.04-0.15 Hz) bpm | 5894 ± 815 | ↓13%, *P* < .05 |
|  |  |  |  |  |  | 10' Finapres | HF HRV (0.15-0.40 Hz) bpm | 5493 ± 1472 | No changes |
|  |  |  |  |  |  |  | LF-to-HF ratio | 1.23 ± 0.47 | ↓19%, *P* < .05 |
|  |  |  |  |  |  |  | LF SBP (0.04-0.15 Hz) mmHg2 | 183.1 ± 46.8 | ↓14%, *P* < .01 |
|  |  |  |   |   |   |  | LF DBP (0.15-0.40 Hz) mmHg2 | 191.0 ± 26.4 | No changes |
| **Ditor, SC 2005**[**38**](#_ENREF_38) | BWSTT | 6 | 37 ± 15 | 7.6 ± 9.4 | C4-T12 | Uncontrolled study | HR bpm | 61.9 ± 9.7 | No changes |
|  |  |  |  |  |  | 16 wk 15-60 min | LF HRV (0.04-0.15 Hz) b/min | 6302 ± 1251 | No changes |
|  |  |  |  |  |  | 10' Finapres | HF HRV (0.15-0.40 Hz) bpm | 4647 ± 664 | No changes |
|  |  |  |   |   |   |  | LF/HF ratio | 1.45 ± 0.44 | No changes |
| **Millar, 2009**[**40**](#_ENREF_40) | BWSTT | 6 | 37 ± 8 | 5.0 ± 4.4 | C5-T10 | Cross-over study | Normalized LF HRV  | 68.1 ±10.3 | No changes |
|  |  |  |  |  | ASIA A-C | 4 wk, 3x/wk | Normalized HF HRV  | 31.9 ±10.3 | No changes |
|  |  |  |  |  |  | 5' Finapres | LF/HF ratio | 4.45 ± 1.32 | No changes |
|  |  |  |   |   |   | (breathing 12/min) | RMSSD | 40.1 ± 23.0 | No changes |
| **Solinsky, 2020**[**15**](#_ENREF_15) | FES-rowing | 15 | 30 ± 1 | 0.8 ± 0.1 | C1-T10 | Randomized controlled | VO2peak, mL/kg/min | 18.3 ± 1.3 | ↑ 11% vs. bsl |
|  | Control | 17 | 25 ± 1 |  | C1-T10 | 24 wk, 2x/wk, 30' | LF HRV (0.05–0.15 Hz) ms2 | 316 ± 55 | No changes |
|  |  |  |  |  | ASIA A-C | 5' Finapres | HF HRV (0.20–0.30 Hz) ms2 | 682 ± 135 | No changes |
|  |  |  |  |  |  | (breathing 15/min) | LF BPV (0.05–0.15 Hz) mmHg2 | 1.39 ± 0.18 | No changes |
|  |  |  |  |  |  |  | HF BPV (0.20–0.30 Hz) mmHg2 | 3.23 ± 0.51 | No changes |
| *Cardiovascular function*  |
| ***Cervical injuries*** |  |  |  |  |  |  |  |  |  |
| **Ditor, SC 2005**[**38**](#_ENREF_38) | BWSTT | 6 | 37 ± 15 | 7.6 ± 9.4 | C4-T12 | Uncontrolled study | Femoral compliance,  | 0.07 ± 0.03 | ↑42%, *P* = .07 |
|  |  |  |  |  |  | 16 wk, 15-60 min | mm2/mmHg |  |  |
|  |  |  |   |   |   | Doppler ultrasound |   |  |   |
| **Matos-Souza, 2016**[**41**](#_ENREF_41) | Upperbody | 8 | 28 ± 2 | 5.1 ± 1.3 | C5-T9 | Non randomized controlled | Resting HR, bpm | 71.4 ± 5.4 | ↑ in controls only |
|  | Controls | 9 | 33 ± 2 | 7.6 ± 1.5 | C4-T8 | 5 yr follow up | Resting SV, mL | 71.4 ± 5.4 | No changes |
|  |  |  |  |  | ASIA A-B | Carotid ultrasonography | Resting CO, L/min | 5.0 ± 0.3 | No changes |
|  |  |  |  |  |  |  | Carotid IMT, mm | 0.74 ± 0.05 | ↓ 24% in trained only |
|  |  |  |  |  |  |  | CCA diameter, mm | 5.3 ± 0.2 | No changes |
|  |  |  |   |   |   |   | CCA resistive index | 0.82 ± 0.02 | No changes |
| **Schreiber, 2018**[**74**](#_ENREF_74) | Athletes | 25 | 30 ± 6 | 9.7 ± 4.5 | C4 to < T6 | Cross-sectional comparison | Carotid IMT, mm | 0.69 ± 0.10 | < 19% in athletes, *P* < .01 |
|  | Sedentary | 16 | 34 ± 7 | 8.2 ± 3.0 | C4 to < T6 | Athletes: 5 yr, 11 h/wk | E/A ratio | 1.43 ± 0.38 | > 13% in athletes, *P* = .14 |
|  |  |  |  |  |  | Carotid ultrasonography | E/Em ratio | 7.7 ± 2.5 | NS ≠ in trained |
|  |  |  |   |   |   | Echocardiography | Adipocytokines | - | NS ≠ in trained |
| **Faulkner, 2019**[**42**](#_ENREF_42) | Exoskeleton | 6 | 30 (13) | 2.7 (1.3) | ASIA A-C | Non-randomized trial | Augmentation index (AIx), % | 30 ± 18 | ↓ 30%, *P* = .001 |
|  | Usual care | 6 | 38 (17) | 3.6 (2.5) | ASIA A-C | 5 d, 90 min | Normalized AIx to HR, % | 21 ± 18 | ↓ 33%, *P* = .001 |
|  |  |  |  |  |  | SphygmoCor | MAP, mmHg | 89 ± 11 | NS ↓, *P* = .47 |
|  |  |  |  |  |  |  | Central SBP, mmHg | 117 ± 17 | No changes |
|  |  |  |   |   |   |   | Central DBP, mmHg | 72 ± 8 | No changes |
| ***Thoracic injuries*** |  |  |  |  |  |  |  |  |
| **Nash, 1997**[**72**](#_ENREF_72) | FES-walking | 12 | 28 ± 7 | 3.9 ± 3.1 | T4-T11 | Uncontrolled study | Cross-sectional area, cm | 0.36 ± 0.06 | ↑ 33%, *P* < .0001 |
|  |  |  |  |  |  | Doppler ultrasound | CFA Flow velocity integral, cm | 16.8 ± 3.8 | ↑ 26%, *P* < .05 |
|  |  |  |  |  |  | CFA = common femoral artery | CFA pulse volume, mL | 6.0 ± 1.7 | ↑ 67% (*P* = .001) |
|  |  |  |  |  |  |  | CFA inflow mL/min | 417.1 ± 122 | ↑ 56% (*P* < .01) |
|  |  |  |  |  |  |  | Resting HR, bpm | 70.1 ± 10.1 | ↓ 7% (*P* < .05) |
| *Blood markers of cardiovascular risk* |
| ***Cervical injuries*** |  |  |  |  |  |  |  |  |  |
| **Hjeltnes, 1997**[**65**](#_ENREF_65) | FES-cycling | 5 | 35 ± 3 | 10 ± 3 | C5-C7 | Uncontrolled study | VO2peak, mL/kg/min | ~7.5 ± 2.0 | ↑70% (*P* < .05) |
|  |  |  |  |  |  | DEXA and CT scan | Whole body fat  | 29.7 ± 2.6 | ↓ 7% (*P* < .05) |
|  |  |  |   |   |   |   | Lower limb muscles CSA, cm2 | 267 ± 27 | ↑ 21% (*P* < .05) |
| **Midha, 1999**[**44**](#_ENREF_44) | Wheelchair | 12 | 22-58 | 12 ± 7 | C6-L3 | Uncontrolled study | VO2peak, mL/kg/min | 19 + 6 | ↑ 25%, *P* = .02 |
|  |  |  |  |  |  | 10 wk, 2-3/wk, 30' | Resting HR, bpm | 93 ± 14 | ↓ 29%, *P* = .02 |
|  |  |  |   |   |   | Blood samples | Fasting serum cholesterol, mg/dL | 185 ± 42 | ↓ 8%, *P* = .04 |
| **de Groot, 200343** | Arm-crank High | 3 | 39 (2) | 0.3 ± 0.3 | C5 to L1 | Randomized controlled study | VO2peak, mL/kg/min | ~14 ± 6 | ↑+33% High vs. Low |
|  | Arm-crank Low | 3 | 52 (2) | 0.3 ± 0.3 | C5 to L1 | 8 wk, 3/wk [75% vs. 45%HRR] | Total Chol/HDL (post/pre)  | 100 (20) | ↓ 23% High vs. Low |
|  |  |  |  |  |  | Fasting blood samples | Triglycerides (post/pre) | 95 (14) | ↓ 32% High vs. Low |
|  |  |  |   |   |   | HOMA-CIGMA test | Insulin sensitivity | 156 (55) | NS↓ High vs. NS↑ Low |
| **Kim, 2019**[**45**](#_ENREF_45) | Aerobic + resistance | 11 | 36 ± 6 | (2-27) | C4-L1 | Randomized controlled trial | VO2peak, mL/kg/min | 11.7 ± 8.1 | ↑ 35%vs. bsl, *P* < .05 |
|  | Control | 6 |  |  |  | 6 wk, 3/wk, 60' | Insulin, μU/ml | 7.5 ± 4.7 | ↓ 40%, *P* < .05 |
|  |  |  |  |  |  | Fasting blood samples | HOMA-IR | 1.5 ± 1.0 vs | ↓ 40%, *P* < .05 |
|  |  |  |  |  |  |  | Fat mass, % | 35.3 ± 10.8 | ↓ 6%, *P* < .05 |
|  |  |  |  |  |  |  | Total Chol, mg/dL | 162.3 ± 34.1 | No change |
|  |  |  |  |  |  |  | HDL-C, mg/dL | 48.7 ± 21.3 | ↑ 12%, *P* < .05 |
| ***Thoracic injuries*** |  |  |  |  |  |  |  |  |
| **Ordonez, 2013**[**46**](#_ENREF_46) | Arm-crank | 9 | 29 ± 3 | 4.6 ± 0.3  | < T5 | Randomized controlled trial | VO2peak, ml/kg/min | 23.2 ± 2.1 | ↑10% vs. pretest |
|  | Control | 8 | 30 ± 3 | 4.6 ± 0.3 | < T5 | 12 wk, 3/wk, 30' | PTAS, mmol/L | 0.64 ± 0.2 | ↑ 37% vs. pretest |
|  |  |  |  |  |  | 50 - 65%HRR | GP activity, U/g Hb | 23.6 ± 2.4 | ↑ 18% vs. pretest |
|  |  |  |  |  |  | Fasting blood samples | Lipid peroxidation, mmol/L | 0.48 ± 0.13 | ↓ 27% vs. pretest |
|  |  |  |   |   |   |   | Protein oxidation, nmol/mg  | 1.92 ± 0.3 | ↓ 31% vs. pretest |
| **Rosety-Rodriguez, 2014**[**47**](#_ENREF_47) | Arm-crank | 9 | 29 ± 3 | 4.6 ± 0.3  | < T5 | Randomized controlled trial | PAI-1, ng/dL | 29.8 ± 6.2 | No change |
|  | Controls | 8 | 30 ± 3 | 4.6 ± 0.3 | < T5 | 12 wk, 3/wk, 30' | Adiponectin, ng/mL | 18.8 ± 4.1 | No change |
|  |  |  |  |  |  | Fasting blood samples | Leptin, ng/mL | 9.6 ± 2.7 | ↓ 20% vs. pretest and Control |
|  |  |  |  |  |  | TNF-a, pg/mL | 23.3 ± 5.6 | ↓ 13% vs. pretest and Control |
|  |  |  |   |   |   |   | IL-6, pg/mL | 6.7 ± 2.2 | ↓ 61% vs. pretest and Control |

\*SCI and spina bifida

**Abbreviations**: Aix, Augmentation index; ASIA, American Spinal Injury Association impairment scale; BPV, Blood pressure variability; Bsl = baseline; CCA, common carotid artery; CFA, common femoral artery; CO, cardiac output; DBP, diastolic blood pressure; E/A, peak early/atrial velocity ratio; EDV, end diastolic volume; E, peak early inflow velocity; EPI, epinephrine; ESV, end-systolic volume; GP, glutathione peroxidase ; Hb, hemoglobin; HDL, high density lipoprotein, HF, high frequency; HOMA-IR, homeostasic model assessment of insulin resistance; HR, heart rate; HRV, heart rate variability; IMT, intima media thickness; ISWT, interventricular septal wall thickness; IVST, intra-ventricular septum thickness; LF, Low frequency; IL-6, interleukin 6; LV, left ventricle; MAP, mean arterial pressure; MHC, myosin heavy chain; NE, Norepinephrine; PA, physical activity; PAI-1, plasminogen activator inhibitor type 1; PO, power output; PTAS, Plasmatic total antioxidant status; PWV, pulse wave velocity; RER,respiratory equivalent ratio; RMSSD, root means square standard deviation; SBP, systolic blood pressure; SV, stroke volume; TNF-α, tumor necrosis factor alpha; VE, minute ventilation; VFR, ventricular filling rate; VO2peak, peak O2 uptake; 6MWD, 6 minute walking distance.