Author Year Country Research Design Score Total Sample Size	Methods	Outcome
Gauthier et al. 2018 Canada RCT PEDro=5 $N_{initial}$=11 $N_{initial}$=9	**Population:** *HIIT Group (n=4):* Mean age= 33.9 yr; Gender: males=3, females=1; Level of injury range: C7-T10; Mean time since injury: 6.0 yr. *MICT Group (n=5):* Mean age= 43.2 yr; Gender: males=3, females=1; Level of injury range: C6-T11; Mean time since injury: 15.5 yr. **Intervention:** Participants were randomized to a home-based self-managed manual wheelchair program. The high-intensity interval training (HIIT) group alternated 30s high-intensity intervals and 60s low-intensity intervals. The moderate-intensity continuous training (MICT) maintained a constant moderate intensity. The programs were six wks, consisting of three 40-min propulsion training session/wk. **Outcome Measures:** Cardiorespiratory Fitness: VO_2, Heart Rate (HR), PO_{peak}, RPE_{muscu}, RPE_{cardio}; Upper Limb Strength: Shoulder (flexors, extensors, abductors, adductors, internal rotators, external rotators), Elbow (flexors, extensors).	1. Cardiorespiratory fitness outcomes improved, but not significantly between groups from pre- to post- intervention ($p>0.05$). 2. Similarly, upper limb strength did not significantly improve between groups for all outcome measures ($p>0.05$). 3. The results suggest that the HIIT program appears feasible and safe and has comparable effects on most cardiorespiratory fitness and upper limb muscle strength values versus the MICT program.
van der Scheer et al. 2016 USA RCT PEDro=7 N=29	**Population:** *Exercise Group (n=14):* Median age= 55 yr; Gender: males=12, females=2; Level of injury range: C4-L5; Median time since injury: 16.0 yr. *Control Group (n=15):* Median age= 57 yr; Gender: males=10, females=5; Level of injury range: C4-L5; Median time since injury: 20.0 yr. **Intervention:** Inactive manual wheelchairs (MWC) users were randomized to exercise group, or no exercise. The low-intensity training program was 16wks, consisting of wheelchair treadmill propulsion 2x/wk for 30min. **Outcome Measures:** Peak aerobic work capacity: VO_{2peak}, PO_{peak}**;** Submaximal fitness: ME_{sub1}, ME_{sub2}; Anaerobic work capacity: 5s peak power output over a 15-m overground sprint (P5-15m); Isometric Strength; Wheelchair Skills Performance (WSP): performance time, ability score, strain score; Physical activity levels: Physical Activity Scale for Individuals with Physical Disabilities (PASIPD), distance.	1. Participants were, on average, able to increase power output and velocity over the training period. 2. 10/14 participants felt that the training improved their fitness. 3. Most participants reported that wheelchair skill performance and physical activity levels had not changed. 4. No significant training effects were found in peak aerobic work capacity, WSP or Physical activity levels. 5. P5-15m was the only outcome measure that was statically significant between the control and intervention group ($p=0.02$).

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Torhaug et al. 2016 Norway Prospective Controlled Trial $N_{initial}$=18 N_{final}=16	**Population:** *MST (n=9):* Median age= 42.0 yr; Gender: N/S; Level of injury range: T4-L1; Median time since injury: 14.6 yr. *CG (n=7):* Median age= 47.1 yr; Gender: N/S; Level of injury range: T4-T12; Median time since injury: 15.4 yr. **Intervention:** In order to evaluate wheelchair propulsion work economy (WE), participants either received maximal bench press strength training (MST), or to the control group (CG). MST group performed training 3x/wk, for 6wks, with 4 sets of four bench press repetitions. CG performed no formalized exercise routine. **Outcome Measures:** WE: Oxygen uptake (VO_2), Pulmonary ventilation (VE), Respiratory exchange ratio (RER).	1. MST significantly improved WE compared to CG by 17.3% 2. Mean reduction in VO_2 was significantly improved in MST group compared to CG (p=0.007). 3. VE and RER did not significantly differ between groups (p=0.96, p=0.9, respectively.
Kilkens et al. 2005 Netherlands Cohort N=97	**Population:** Mean age: 38yr; Gender: males=74, females=24; Level of injury: paraplegia=73, tetraplegia=25. **Intervention:** Wheelchair Circuit test-eight standardized tasks in a fixed sequence on treadmill, hard and soft surface. **Outcome Measures:** Upper extremity strength through manual muscle testing (MMT), Peak oxygen uptake (VO_2 peak), Peak power output (PO peak), Wheelchair Circuit ability, physical strain and performance.	1. All physical parameters had significant improvements over time. 2. PO peak improved between t1 and t2 and t2 and t3 (p<0.001). Maximum VO_2 peak improved between t1 and t2 (p<0.001) and t2 and t3 (p=0.046). MMT also improved between t1 and t2 (p=0.018), and t2 and t3 (p=0.014). 3. Wheelchair circuit scores had significant improvements over time as well. 4. Wheelchair circuit ability improved between t1 and t2 (p<0.001) and t2 and t3 (p=0.013). Performance time also improved between t1 and t2 (p<0.001) and t2 and t3 (p=0.002). Physical strain improved between t1 and t2 and t2 and t3 (p=0.001).
Qi et al. 2015 China Pre-Post N=11	**Population:** Mean age: 42.1 yr; Gender: males=8, females=3; Level of Injury: paraplegia (T6-L1)=11; Severity of injury: AIS A=8, AIS B=1, unspecified=2; Mean time since injury: 10.4 yr. **Intervention:** Patients completed three sets of 3 min wheelchair propulsion trials at different speeds; a self-selected comfortable speed, 1 ms, 1.3 ms and 1.6 ms with a 5 min rest period between each trial. After a 15 min break, patients then	1. Propulsion at 1.6 ms resulted in significantly higher levels of VO_2 Peak output, RPE Respiration and ventilation volume compared to propulsion at 1ms and at self-selected speed (all p<0.05). 2. No significant differences were found between RPE Respiration and Arm Exertion at different VO_2 Peak levels during the graded exercise trial. 3. No significant differences were reported between trials for RPE

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	completed a graded exercise trial at a constant speed of 1 ms with a work load set at 10 W and increasing by 5 W every 1 min until exhaustion. Outcome measures were performed during each trial with perceived rate of exertion for respiration and for local shoulder and arms exertion. **Outcome Measures:** Ratings of perceived exertion (RPE) according to 15-point Borg Scale, Oxygen uptake (VO_2), Carbon dioxide output (VCO_2), Heart rate, Ventilation volume.	Respiration and RPE Arm Exertion.
de Groot et al. 2007 Netherlands Pre-Post N=80	**Population:** Mean age: 39.4 yr; Gender: males=61, females=19; Mean weight: 72.9 kg; Level of injury: tetraplegic=18, paraplegic=62. **Intervention:** Patients with SCI were tested with wheelchair exercise tests at start of inpatient rehabilitation (T1), 3 mo post (T2), at discharge (T3) and 1 year after rehabilitation (T4) to determine whether mechanical efficiency (ME) relates to wheelchair propulsion capacity and wheel chair performance tasks. Testing was done in a standard w/c, and included two 3 min submaximal steady state w/c exercises on treadmills, a peak aerobic test and four standardized w/c performance tasks (figure-of-eight, 15 m sprint, propelling on treadmill with 3% slope, propelling on a treadmill with 6% slope for 8 sec. **Outcome Measures:** Energy expenditure (En), Respiratory exchange ratio (RER), Mechanical efficiency (ME), Peak power output (POpeak), Performance time score and physical strain score.	1. ME showed a significant relationship with PO_{peak} ($p \leq 0.002$) where a 1% higher ME related to a 1.6-2.2 W higher PO_{peak}. 2. A significant relationship was found between the ME and POpeak, and the sum of performance time in exercise block 2 only of the sum of the performance time of a 15-m sprint and for figure-of-eight in exercise block 2 only ($p=0.02$) when correcting for lesion level, $VO2_{peak}$, ME was not related to the physical strain (%HRR, calculated for the 3% and 6% slope tests) at either one of the two exercise blocks (B1: $p=0.56$; B2: $p=0.85$).

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Dallmeijer et al. 2005 Netherlands Pre-Post N=132	**Population:** Mean age: 39.4 yr; Gender: males=100, females=32; Mean weight: 72.9 kg; Level of injury: tetraplegic=37, paraplegic=95; Mean time since injury 269 days. **Intervention:** Patients were investigated at start of active rehabilitation (T1), 3 mo (T2) and end of clinical rehabilitation (T3) to describe the course of wheelchair propulsion capacity (WPC). WPC was measured as maximal power output achieved in a maximal wheelchair exercise test on treadmill. **Outcome Measures:** Maximal power output (PO_{max}).	1. The mean (modeled) PO_{max} for the whole group was 30.6 W at t1, and 39.3 W and 44.3 W, at t2 and t3, respectively (p=0.000). 2. POmax increased significantly between t1 and t2 *8.7 W; 28%) and between t1 and t3 (13.7 W; 45%). 3. Persons with paraplegia had (on average) a 21.9W higher PO_{max} than persons with tetraplegia (β=21.9) (p=0.000). 4. Persons with incomplete lesions had (on average) a 5.4 W higher PO_{max} than persons with complete lesions (β =5.4) (p=0.043). 5. Changes in POmax depend on age and gender; younger (β=-0.254) (p=0.026) and male persons (β=7.235) (p=0.021) showed larger increases in POmax than older and Females participants. 6. The inability to perform the test at t1 was controlled; this control variable was highly significant, showing on average a 14.5 W (p=0.000) lower POmax for subjects who were not able to perform the test at t1 compared with those who were able to do so.
Rodgers et al. 2001 USA Pre-Post N=19	**Population:** Mean age: 44 yr; Gender: males=16, females=3; Mean height: 174.5 cm; Mean weight: 79.1 kg; Injury etiology: SCI=15, spina bifida=1, multi-trauma=2, bilateral tarsal tunnel syndrome=1; Mean duration of manual w/c use: 17 yr. **Intervention:** Participants who were manual wheel chair users >1 yr took part in supervised therapeutic exercise (strengthening of posterior deltoids, infraspinatus, teres minor, rhomboids, middle trapezius, erector spinae, biceps and wrist extensors muscles, stretching and aerobic exercise using w/c seated rowing machine) 3x/wk for 6 wk. Pre- and post-tests included 1) a maximal graded exercise test (GXT) where participants rested for 6 min, then propelled for 3 min at a rate to 3 km/h after which a load of 0.3 kg was added every 3 min until the rate of propulsion could no longer be maintained	1. Exercise load significantly increased for all strengthening activities (p<0.01). 2. Handgrip strength measures were unchanged. 3. Wheelchair propulsion stroke frequency significantly decreased following training (p=0.039) as well as power output (p=0.012). 4. Significant increase with training in shoulder flexion/extension (p=0.013), maximum elbow extensions (p=0.03) and trunk flexion (p=0.001). 5. Of wheelchair kinetic measures, only propulsive moment (Mz) significantly increased with training (p=0.010), showing 14% improvement in propulsive moment. 6. Wrist extension only joint kinetic measure to significantly increase after training (p=0.033).

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	and 2) a fatigue test which was the same as the GXT except the load added was the maximum load; participants propelled until volitional exhaustion. All pre-post testing was completed on a prototype w/c ergometer with 22" hand rim and no wheel camber. **Outcome Measures:** Handgrip strength (average of 3 measures of dominant hand), heart rate, exercise load changes, kinetic and kinematic data using 3 Peak 3D CCD camera and video system, a PY6-4 force/torque transducer, a potentiometer and a 3D-linked segment model, handrim kinetics, propulsion temporal data, Oxygen Update (VO_2), Metabolic Economy.	7. Trunk flexion/extension ROM and wrist flexion moment both significantly increased with fatigue following training ($p<0.05$).