Author Year Country Research Design Score Sample Size	Methods	Outcome
McBain et al. 2015 Australia Pre-post Level 4 N = 7	**Population:** 7 patients with SCI (7M 0F) Mean (SEM) age: 56(4) Mean (SEM) DOI: 18(7.5) years All with motor impairments above C7 **Treatment:** Abdominal muscle ES. **Outcome Measures:** Pga and Pes, PEFR during cough.	1. Significant increase in mean Pga, Pes, PEF during cough and total expiratory volumes from near TLC and expiratory volume below FRC during stimulated cough. 2. Significantly greater increase in Pga, Pes, PEF during cough and total expiratory volumes from near TLC with increasing stimulus intensity. 3. Pga & Pes did not plateau except in one patient at intensity of 400mA. 4. PEF during cough plateaued in all patients at a mean(SD) intensity of 211(29)mA and expiratory volume of 4.0(0.4)L.
McBain et al. 2013 Australia RCT (crossover) PEDro = 5 Level 2 N = 15	**Population:** 15 males with SCI (C4-T5); mean (SD) age: 45(4); DOI: 11.9(4.3) yrs. **Treatment:** All participants trained for 6 weeks, 5 days per week (5 sets of 10 coughs per day). Participants coughed voluntarily at the same time as a train of ES was delivered over the abdominal muscles via posterolaterally positioned electrodes (50Hz, 3s). **Outcome measures:** Pes and Pga expiratory pressures, peak	1. During voluntary coughs, FES cough stimulation improved Pga, Pes, and PEFcough acutely, 20-fold, 4-fold, and 50%, respectively. 2. Six weeks of cough training caused further improvements. It significantly increased Pga (SD) from 37.1(2.0) to

	expiratory flow (PEFcough) produced before, during, and after the training.	46.5(2.9)cmH_2O, Pes from 35.4(2.7) to 48.1(2.9)cmH_2O, and PEFcough from 3.1(0.1) to 3.6(0.1) L/s. 3. Cough training also improved pressures and flow during voluntary unstimulated coughs.
McLachlan et al. 2013 UK Longitudinal study Level 4 N = 12	**Population:** 12 participants with tetraplegia (11M;1F); median age: 31 yrs (range: 18-73); 7 AIS A, 5 AIS C; median DOI: 5 months (range: 2-94). **Treatment:** 3 weeks of abdominal muscle conditioning using transcutaneous abdominal FES. **Outcome measures:** FVC, FEV_1, PEFR, MEP.	1. Mean (SD) FVC increased by 0.36(0.23) L during training. 2. No significant changes were found in mean FEV_1 and PEF. 3. No significant change was found in the outcome measures during a 1-week pre-training control phase and during a 3-week post-training phase.
Hascakova-Bartova et al. 2008 Belgium Prospective controlled trial Level 2 N = 10	**Population:** 10 participants with SCI, age range 23 – 71 years; 9M 1F, lesion level T10 – C5; 6 with AIS-A, 4 with AIS-B or C. **Treatment:** 4 participants were assigned to abdominal neuromuscular ES for 25 min daily for 8 weeks. 3 participants receive placebo, and 3 had placebo followed by ES. **Outcome Measures:** FVC	1. ES significantly worsened FVC when measured during non-stimulation in the ES group. 2. In the placebo-controlled group there were no differences in FVC. 3. In the placebo-followed by ES group, after ES all participants has worsened FVC.
Spivak et al. 2007 Israel Pre-post Level 4 N = 10	**Population:** 10 male patients aged 22-60 years with tetraplegia. AIS- A n=2; AIS B n=7l; AIS C n=1 **Treatment:** Respiratory tests: 1) without assistance; 2) with manually assisted expiration;	1. With unassisted breathing, PEF, FVC, MVV were 60% lower than that expected in people without SCI. 2. Manual assistance significantly

	3) FES-assisted expiration activated by a caregiver; 4) manually self-activated FES-assisted expiration; and 5) FES-assisted expiration activated by EMG signals elicited from the patient's own muscle. **Outcome Measures:** PEF, FVC, MVV.	improved the mean PEF by 36.7%, and FVC by 15.4%. MVV improved but was not significant. 3. FES did not significantly change the measurements, however, EMG-activated FES significantly increased PEF and FVC by 15.8 and 18.9% respectively when compared to patient-activated FES.