Author Year; Country Date included in the review Total Sample Size Level of Evidence Type of Study Score	Methods Databases	Conclusions
Cragg et al. 2012; Canada Reviewed published articles from 1981 to 2011 N = 30 **Level of evidence:** PEDro scale was used to evaluate studies **Type of study:** 2 RCT 1 prospective controlled trial 10 Pre-post 17 No intervention AMSTAR: 7	**Method:** Systematically review the management of some potentially modifiable CVD risk factors for the chronic SCI population. Any peer-reviewed human studies or reviews with or without treatments examining CVD risk factors specific to the chronic traumatic SCI population were included. Exclusion criteria include animal studies, non-English. **Database:** MEDLINE/PubMed, EMBASE, Cochrane Library and hand-searching.	1. One RCT provided level 1 evidence that niacin was efficacious in improving lipid profiles in individuals with chronic tetraplegia. 2. There is no consensus about the optimal frequency of obtaining CRP levels in individuals with SCI. 3. Following SCI, there is consistent evidence of a greater prevalence of abnormal glycemic control relative to able-bodied controls. 1. Several pre-post studies provided level 4 evidence that the use of FES or treadmill walking favorably influence glycemic control.
Hicks et al. 2011; Canada Reviewed published articles before March 2010 N= 82 (69 chronic, 13 acute SCI) **Level of Evidence:** PEDro scale was used to evaluate studies **Type of study:** Not described AMSTAR: 7	**Methods:** Literature search for published English case studies, experimental and quasi experimental design studies related to fitness benefits of physical activity or exercise training intervention in SCI persons Interventions included exercise and FES. Outcome measures included muscle strength, body composition, physical capacity and functional performance **Databases:** MEDLINE (1950–March 2010, OVID Interface); PsycINFO (1840–March 2010, Scholars Portal Interface); EMBASE (1980–March 2010, OVID Interface); CINAHL (1982–March 2010, OVID Interface); SPORTDiscus (–March 2010).	1. There is strong evidence (level 1 and 2) that exercise, performed 2–3 times per week at moderate-to-vigorous intensity, increases physical capacity (e.g. VO_2 peak) and muscular strength in the chronic SCI population 2. There is insufficient quality evidence to draw meaningful conclusions on its effect on body composition or functional capacity in chronic SCI 3. There were insufficient high-quality studies in the acute SCI population to draw any conclusions 4. Wheelchair ergometry has been shown to significantly increase peak power output (a measure of physical capacity) following 6 weeks of training 4. 16 studies (2 level 1 RCTs) provide strong evidence that combined resistance and aerobic exercise, and functional electrical stimulation (FES)-assisted exercise, produced significant improvements in power output.
Phillips et al. 2011; Canada Reviewed scientific publications from 1950 N=27 **Level of Evidence:** PEDro scale was used to evaluate studies	**Method:** Literature search for articles evaluating the effect of exercise as a therapy to alter arterial function in persons with SCI Interventions included passive leg exercise, FES, single muscle electrical stimulation, upper body continuous aerobic exercise, acute combined arm passive leg exercise and BWSTT. Outcome measures included femoral blood flow velocity, heart rate and	Acute combined arm and passive leg exercise: 1. There is currently one paper with level 4 evidence that reported increased leg blood flow in response to combined arm exercise and passive leg movements Stretch-induced contractions: 2. There is currently one paper with level 2 (debatable but reliable results) evidence investigating blood flow changes in response to stretch-induced contractions. With such limited data, it is difficult to

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Type of study: 1 RCT 8 prospective controlled trials 15 pre-post 2 case-control 1 case report AMSTAR: 6	vascular measures. **Databases:** MEDLINE, EMBASE, Cochrane Library, ACP Journal Club, DARE, CCTR, CMR, HTA, NHSEED, PsycINFO, SPORTDiscus and CINAHL	interpret the value of this exercise technique Passive leg exercise: 3. There is currently level 1 evidence supporting a passive leg exercise program as a technique to improve vascular function among individuals with paraplegia. Arm exercise: 4. 2 papers (level 3 and level 5) appear to suggest that long-term upper body exercise can improve arterial structure and function in those with SCI.
Deley et al. 2015 France Systematic Review N= 12 **Level of evidence:** Methodological quality was not assessed **Type of study:** Types of studies included not specified. AMSTAR= 5	**Methods:** A literature search was conducted to identify articles on different FES methods- including cycling, rowing and strengthening. The purpose is to compare the different FES methods, and the intention is to provide practical information for clinicians and people working with FES. Outcome measures include VO2 (L/min), heart rate (beats/min), stroke volume (mL/beat), and cardiac output (L/min). **Databases**: PubMed, Google Scholar	1. Crameri and colleagues suggest that the load applied to paralyzed muscles during an ES strengthening program is an important factor. Indeed, it determines the amount of muscle adaptation that can be achieved, with greater beneficial effects after isometric training in comparison with concentric exercises. 2. Authors reported that the mechanical efficiency of this exercise was low (*8 %) Moreover, this type of training often does not achieve sufficiently high levels of aerobic work and a plateau in training effect is quickly reached.
Warburton et al. 2007; Canada Reviewed published articles from 1980 to March 2006 N=42 **Level of Evidence:** PEDro scale was used to evaluate studies **Type of study:** 35 pre-post 3 prospective controlled trial 4 RCTs AMSTAR: 5	**Methods:** Literature search for English articles regarding the risk of cardiovascular disease (CVD) and the effectiveness of varied exercise rehabilitation programs for CVD in SCI Interventions included treadmill training (BWSTT), upper extremity exercise and FES training. Outcome measures included glucose homeostasis, lipid lipoprotein profiles and blood pressure. **Databases:** PubMed/MEDLINE, CINAHL, EMBASE, PsychINFO	1. Primarily level 4 evidence, which indicates various exercise modalities (including arm ergometry, resistance training, body weight supported treadmill training (BWSTT), and functional electrical stimulation (FES) may attenuate and/or reverse abnormalities in glucose homeostasis, lipid lipo- protein profiles, and cardiovascular fitness 2. There is level 1 and level 4 evidence that both aerobic and FES training (approximately 20–30 min/day, 3 days/week for 8 weeks or more) are effective in improving glucose homeostasis in persons with SCI. 3. There is level 4 evidence from pre-post studies that FES training performed for a minimum of 3 days per week for 2 months may be effective for improving musculoskeletal fitness, the oxidative potential of muscle, exercise tolerance, and cardiovascular fitness. 4. There is level 1 evidence for the role of

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		exercise in the reduction of lipid lipo-protein profiles involved in formation of arteriosclerosis and the reduction of the risk for CVD in persons with SCI. 5. Exercise training appears to be an important therapeutic intervention for reducing the risk for CVD and multiple comorbidities (such as type 2 diabetes, hypertension, obesity) in individuals with SCI.
Deley et al. 2015 Switzerland Narrative Review **Level of evidence:** Methodological quality was not assessed **Type of study:** Types of studies included not specified. AMSTAR:4	**Method:** Narrative review of English publications. The aim of the review is to discuss some evidence-based physiological and methodological consideration for optimal use of FES for training in paraplegia. Exclusion criteria: English language literature search **Database:** PubMed & Google Scholar	1. Most studies reported significant increases in VO2, during FES interventions as compared with resting values. V02 values were also significantly higher during hybrid intervention compared to exercises only involving upper limbs (arm cranking). 2. Most studies reported significant increases in heart rate during FES sessions with arm cranking, whereas during FES-cycling, heart rate was lower. 3. Functional electrical stimulation (FES), used to facilitate exercise in individuals with spinal cord injury, is associated with major benefits to both the muscular and cardiovascular and pulmonary systems. 4. When used regularly and with appropriate settings, FES exercises have beneficial effects on muscle characteristics, force output, exercise capacity, bone mineral density and cardiovascular parameters. 5. FES rowing might be the most appropriate technique to see training effects on the muscular, cardiovascular, and respiratory levels.
Myers et al. 2012; Dates searched not specified. Number of studies reviewed not specified. **Level of evidence:** Methodological quality was not assessed **Type of study:** Types of studies included not specified. AMSTAR: 4	**Method:** Reviewed the prevalence of CVD and associated cardiometabolic risk markers in SCI and describes the available evidence supporting the benefits of physical activity in persons with SCI. Inclusion/exclusion criteria for articles not specified. **Database:** Databases searched not specified.	1. In 7 low-level studies, lipid profiles in persons with SCI have generally been shown to respond favorably to both diet and exercise intervention. 2. In 2 studies, exercise programs of several weeks duration using arm ergometry or circuit resistance training have been shown to increase HDL in the range 10-20% and to reduce the ratio of total cholesterol to HDL. 3. 3 studies supported the use of circuit training to improve both fitness and lipid profiles in persons with paraplegia. 4. There is a paucity of evidence regarding the effects of physical activity on changes in body mass in persons with SCI. 5. 4 studies support physical activity and fitness level as a determinant of reduced

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		insulin resistance in SCI.
Carlson et al. 2009; USA Reviewed published articles from 1990 to 2008 N= 22 **Level of Evidence:** Methodological quality not assessed **Type of study:** 15 intervention case-series 7 cross- sectional surveys AMSTAR: 4	**Methods:** Literature search for articles written in English evaluating the effect of exercise interventions on carbohydrate and lipid metabolism in adults with chronic SCI. Interventions included active exercise and electrical stimulation ; outcome measures included glucose, insulin, and cholesterol levels **Databases:** MEDLINE (1996–2008), Cochrane Library, bibliographies of identified articles, and expert recommendations	1. Evidence is insufficient to determine whether effects of exercise improves carbohydrate and lipid metabolism disorders among adults with SCI
Hamzaid & Davis 2009; Australia Reviewed published articles from 1830 to 2008 N= 33 **Level of Evidence:** No formal validity assessment was described **Type of study:** 1 RCT, 32 quasi-experimental AMSTAR=4	**Methods:** Literature search for published articles written in any language and related to functional electrical and neuromuscular stimulation, exercise, health and fitness, and lower limbs of neuromuscular stimulation Interventions include: FES training (cycling, ergometry, rowing, leg muscle contraction, knee extension and treadmill). Outcome measures include: cardiovascular and peripheral blood flow, aerobic fitness, functional exercise capacity, bone mineral density and psychosocial outlook. **Databases:** Ovid MEDLINE (1966-July 31 2008), Ovid MEDLINE Daily Update, PREMEDLINE, Ovide OLDMEDLINE (1950-1965), SPORTDiscus (1830-July 31, 2008), Web of Science (1900- July 31, 2008), Cochrane Library and Database	1. FES-evoked exercise studies demonstrated positive changes within skeletal muscle, enhanced cardiovascular and peripheral blood flow, altered metabolic responses and increased aerobic fitness, and improved functional exercise capacity- strength and endurance 2. Positive bone health improvements with FES-evoked leg training only on some localized areas of bones, particularly in the hips, knee area and shank - FES-induced treadmill walking delivered more positive outcomes than other modalities 3. Bone mineral density changes and alterations of psychosocial outlook were less consistently reported or outcomes were deemed equivocal. 4. FES-evoked leg exercise promotes certain health and fitness benefits for people with SCI