Evidence map of physical activity and exercise interventions for the treatment of chronic diseases

Evidence Map No. 1

Developed as part of the OHRI-Champlain LHIN Knowledge to Action research program

September 2011

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Chronic diseases such as cardiovascular disease and cancer are a leading cause of mortality.[1] Key components of reducing mortality due to chronic disease are physical activity (PA), defined as increasing energy expenditure through bodily movement, and exercise, an intentional form of PA in which the goal is improved physical fitness.[2]

The objective of this report was to create an evidence map of systematic reviews (SRs) concerning PA and exercise interventions for the following chronic diseases: coronary artery disease (CAD), congestive heart failure (CHF), type 2 diabetes, cancer, and chronic obstructive pulmonary disease (COPD). The aim is to support the knowledge needs of clinicians and other stakeholders in the Champlain LHIN considering the implementation of physical activity and/or exercise interventions to reduce the burden of chronic disease in this region.

Key Trends in the Evidence

- **CAD/CHF:** Studies included in SRs looked at both aerobic and resistance exercise. Common outcomes were blood lipid levels, cardiac function, physical fitness measures, body weight/composition, quality of life (QoL), cardiovascular events, hospitalization, and mortality.

- **Cancer:** Studies included in SRs examined aerobic and resistance exercise, range of motion exercises, and stretching exercises. Outcomes included fatigue, pain, emotional state, physical fitness, QoL, body weight/composition, and mortality. Many studies focused on breast cancer, with shoulder mobility, lymphedema, and seroma formation as additional outcomes.

- **COPD:** Studies included in SRs evaluated aerobic and resistance exercise, pulmonary rehabilitation programs including exercise, and inspiratory muscle training. Outcomes commonly evaluated were dyspnea, oxygen consumption, inspiratory muscle strength and endurance, exacerbations, exercise capacity, emotional state, body weight/composition, QoL, hospitalization, and mortality.

- **Type 2 Diabetes:** Most studies included in SRs looked at aerobic and resistance exercise. Frequently measured outcomes were glycated hemoglobin, glycemic control, insulin sensitivity, blood glucose, body weight/composition, diabetic complications, QoL, and mortality.

Who is this summary for?

This summary was undertaken for the Chronic Disease Prevention and Management Collaborative of the Champlain Local Health Integration Network and is intended for use by local health systems stakeholders (e.g., clinicians, policy-makers ,decision-makers)

Information about this evidence summary

This report covers a broad collection of literature and evidence sources **with a search emphasis on systematic reviews.** Systematic reviews are generally favoured over other study designs, because they incorporate evidence from multiple primary studies, instead of reporting evidence from just one study.

☑ This summary includes:

- **Key findings** from a broad collection of recent literature and evidence sources.

☒ This summary does not include:

- **Recommendations**;
- **Additional information** not presented in the literature;
- **Detailed descriptions of the interventions** presented in the studies.

All papers summarized in this document are available by request to jthielman@ohri.ca

TABLE 1: Included SRs - Exercise and physical activity interventions for CVD/CHF, cancer, COPD, and type 2 diabetes

CAD/CHF								
Authors (Year)	**Location**	**# of studies**	**Population**	**Intervention**	**Comparator**	**Outcome Measures**	**Main Findings**	**AMSTAR/ Comments**
Haykowsky et al. (2007)[3]	Canada, US	14 RCTs	People with CHF	Aerobic exercise +/- resistance exercise	Usual care	Ejection fraction, end-diastolic volume, end-systolic volume	Aerobic exercise improved ejection fraction (WMD = 2.59%, 95% CI [1.44, 3,74]); end-diastolic volume (WMD = -11.49ml, 95% CI [-19.95, -3.02]); and end-systolic volume (WMD = -12.87ml, 95% CI [-17.80, -7.93]). No improvements for combined aerobic and resistance exercise	AMSTAR=6
Valkeinen et al. (2010)[4]	Finland	18 RCTs	People with CHD	Exercise (aerobic and other exercise modes)	No exercise	Peak oxygen uptake	Exercise improved peak oxygen uptake (SMD = 0.60ml/kg/min, 95% CI [0.47, 0.74]). Aerobic exercise had greater effect than other exercise modes	AMSTAR=6
Van Tol et al. (2006)[5]	Nether-lands	35 RCTs	People with CHF	Exercise	Usual care w/o exercise	Cardiac performance (at rest and during maximal exercise), exercise capacity, HRQoL	At rest: Exercise affected diastolic blood pressure (MD = -2.4mmHg, p=0.021) and end-diastolic volume (MD = -3.13 ml, p=0.017). During maximal exercise: Exercise affected systolic blood pressure (MD = 5.4mmHg, p=0.030); heart rate (MD = 3.5 beats per minute, p=0.11); and cardiac output (MD = 2.51 1 min^{-1}, p=0.004). Exercise improved peak oxygen uptake (MD = 2.06 ml kg^{-1} min^{-1}, p<0.001); anaerobic threshold (MD = 1.91 ml kg^{-1} min^{-1}, p<0.001); 6-MWD (MD = 46.2 m, p<0.001); and HRQoL (MD = -9.7 points, p<0.001) No significant effect on other outcomes	AMSTAR=8
Jolliffe et al. (2001)[6]	UK	32 RCTs	People who have had MI, coronary artery bypass graft, percutaneous transluminary coronary angioplasty, CAD or angina pectoris	Exercise +/- psychological and educational interventions	Usual care	Primary: Mortality (all-cause or cardiac-related), MI, revascularization, CVD events, HRQoL Secondary: smoking, blood pressure, blood lipid levels	Exercise alone improved all-cause mortality (OR = 0.73, 95% CI [0.54, 0.98]) and cardiac mortality (OR = 0.69, 95% CI [0.51, 0.94]) 2) Exercise with psychological or educational interventions improved cardiac mortality (OR = 0.74, 95% CI [0.57, 0.96]), total cholesterol (WMD = -0.57 mmol/l, 95% CI [-0.83,-0.31]), and low density lipoprotein cholesterol (WMD = -0.51 mmol/l, 95% CI [-0.82, -0.19]). No significant effects on other outcomes	AMSTAR=8 In general, included studies had poor quality of reporting and high risk of bias. Results may not be generalizable to broader population
Davies et al.	UK	19 RCTs	People 18+ with	Exercise	Usual care	Mortality (all-cause or due to CHF),	Exercise improved hospitalizations due to CHF (RR =	AMSTAR=10

(2010)[7]			CHF	programs +/- psychological or educational interventions		hospitalizations (all-cause or due to CHF), HRQoL	0.72, 95% CI [0.52, 0.99]) and HRQoL (SMD = -0.56, 95% CI [-0.82, -0.30]). No improvements in all-cause mortality or overall hospitalizations	Update of a previous SR
Clark et al. (2005)[8]	Canada	63 RCTs	People with CAD	Secondary prevention programs, some of which included exercise	Usual care	All-cause mortality, recurrent MI	Exercise only programs improved mortality (RR = 0.72, 95% CI [0.54, 0.95]), but not recurrent MI. Exercise with education or counseling improved recurrent MI (RR = 0.62, 95% CI [0.44, 0.87]), but not mortality	AMSTAR=9
CANCER								
Authors (Year)	**Location**	**# of studies**	**Population**	**Intervention**	**Comparator**	**Outcome Measures**	**Main Findings**	**AMSTAR/ Comments**
Granger et al. (2011)[9]	Australia	16 studies on 13 patient groups (2 RCTs, 2 cohort, 9 case series, others not reported)	People with non-small cell lung cancer	Exercise (pre or post cancer treatment)	Not specified for 2 RCTs, other designs had no control group	Exercise capacity, HRQoL, daily physical activity level, cancer symptoms, mortality	Post-treatment exercise improved exercise capacity and symptoms. Conflicting results on HRQoL. No studies measured physical activity or mortality Aggregated effect estimates not reported due to heterogeneity between studies	AMSTAR=6
Shamley et al. (2005)[10]	UK	12 RCTs	Women with breast cancer	Early shoulder mobilization	Delayed shoulder mobilization	Shoulder range of motion, wound complications, fluid drainage volumes, seroma formation, hospitalization	Delayed exercise decreased seroma formation (OR = 0.4, 95% CI [0.2, 0.5]); no effects for drainage volume or hospital stay. No conclusions for range of motion, fluid drainage, or hospitalization due to heterogeneity between studies	AMSTAR=7 MA carried out on 6 of the 12 studies
McNeely et al. (2010)[11]	Canada	24 RCTs	People 17+ with breast cancer, after surgery	Range of motion, stretching, and resistance exercises	Delayed exercise, usual care (exercise pamphlet, no exercise, general movement within comfort level)	Primary: upper-extremity range of motion, muscular strength, lymphedema, pain Secondary: upper-extremity/shoulder function, QoL, seroma formation	Compared to delayed exercise, early exercise improved short term recovery of shoulder flexion (WMD = 10.6 degrees, 95% CI [4.51, 16.6]); wound drainage volume (SMD = 0.31 ml, 95% CI [0.13, 0.49]); and duration of drainage (WMD = 1.15 days, 95% CI [0.65, 1.65]). Compared to usual care, structured exercise improved shoulder flexion (WMD = 12.92 degrees, 95% CI [0.69, 25.16]). Physical therapy gave additional benefit. No evidence of differences in seroma formation, lymphedema or pain	AMSTAR=9

Markes et al. (2006)[12]	Germany	9 studies (7 RCT, 2 CCTs)	Women with breast cancer undergoing treatment	Aerobic and/or resistance exercise coinciding with other treatment	No exercise, or other intervention	Physical fitness, physical activity behaviour, harms. Physiological, psychological, biological, morphological, and multidimensional outcomes	Exercise improved cardiorespiratory fitness (SMD = 0.66, 95% CI [0.20, 1.12]). Non-significant results for fatigue and weight gain. Limited evidence for other outcomes. Adverse effects observed in 2 trials	AMSTAR=8
McNeely et al. (2006)[13]	Canada	14 RCTs	Breast cancer patients or survivors	Exercise	Usual care, placebo, or other intervention	QoL, physical functioning, fatigue, peak oxygen consumption	Exercise improved QoL, physical functioning, peak oxygen consumption, and symptoms of fatigue. Aggregated effect estimates not reported due to heterogeneity between trials	AMSTAR=8
Ingram et al. (2006)[14]	Canada	14 studies (9 RCTs, 4 NCTs: pre/post-test, 1 case series)	Women with breast cancer	Exercise	Usual care or different intervention for 9 RCTs, no control for other designs	Body weight, body composition	Sparse evidence on effect of exercise on body weight and composition. Effects on body weight more common than on body composition	AMSTAR=6 Outcomes generally considered as secondary endpoints
Chan et al. (2010)[15]	Hong Kong	6 RCTs	Women undergoing treatment for breast cancer	Various exercise programs (resistance, aerobic, stretches, range of motion)	Delayed exercise, written or verbal information	Shoulder mobility, severity of lymphedema (arm circumference, arm volume)	Exercise improved shoulder mobility, but did not improve severity of lymphedema. Aggregated effect estimates not reported	AMSTAR=7
Lee (2007)[16]	UK	4 trials (3 RCTs, 1 CCT)	People (gender not specified) with breast cancer	Tai Chi	Walking, psychosocial support, education	Fatigue, BMI, HRQoL, self-esteem, walking distance, grip strength, daily activity, depression, range of shoulder motion	Effectiveness of Tai Chi for cancer not convincing with current level of evidence	AMSTAR=7 Methodological flaws in most studies
Cramp and Daniel (2008)[17]	UK	28 RCTs	People with cancer (mostly breast)	Exercise	Usual care or other intervention	Cancer-related fatigue, exercise maintenance, attrition, time spent exercising, aerobic capacity, QoL, anxiety, depression, self-efficacy	Exercise improved cancer-related fatigue (SMD = -0.23, 95% CI [-0.33, -0.13]). Results were mixed for the other outcomes	AMSTAR=8
Knols et al. (2005)[18]	Nether-lands	34 trials (27 RCTs, 7 CCTs)	Cancer patients during and after treatment	Exercise during or after treatment	Different intensity, different exercise, no exercise, wait list, or usual care	Physiological measures, performance measures, functioning, symptoms, psychological measures, HRQoL	Exercise improved body composition, bone mineral density, functional capacity, muscle strength, walking distance, symptom relief, psychological well-being, mood status, QoL. Aggregated effect estimates not reported	AMSTAR=6 Trials were of moderate quality
Velthuis et al. (2010)[19]	Nether-lands	18 RCTs	People with any cancer at any	Home-based or supervised	No exercise	Cancer-related fatigue	Supervised exercise improved cancer-related fatigue (SMD = 0.30, 95% CI [0.09, 0.51]).	AMSTAR=6

			stage	exercise			Home-based exercise did not show conclusive results	
Ferrer et al. (2011)[20]	US	78 studies (44 RCTs and 34 NCTs: pre/post-test)	Cancer survivors	Exercise	Different exercise, different activity, no exercise. No control group for pre/post-test studies	QoL	Exercise improved QoL with more pronounced improvements for more intense aerobic exercise and for women. Aggregated effect estimates not reported	AMSTAR=6 Effect estimates greater in high quality studies
Knols et al. (2010) [21]	Switzer-land	5 RCTs	People with cancer	Physical activity (walking, exercise, behaviour change, yoga, or relaxation)	Usual care for 3 RCTs, not reported for other 2 RCTs	Walking (count of # of steps)	Mean change in # of steps in exercise group = 526 (standard deviation = 537). Aggregated effect estimates not reported due to heterogeneity between studies	AMSTAR=8 The 5 RCTs included were of good quality
Beaton et al. (2009)[22]	Canada	8 studies (3 RCTs, 5 case-series)	People with metastatic cancer	Exercise (aerobic, resistance), (alone or part of broader program)	Usual care for 3 RCTs, no control group for 5 case series	Physical measures, QoL	Exercise improved both physical outcomes and QoL. Aggregated effect estimates not reported	AMSTAR=6
De Boer et al. (2011)[23]	Nether-lands	14 articles describing 18 studies (14 RCTs (some quasi or cluster), 4 controlled before/ after)	People 18+ diagnosed with cancer while in paid employment	Several types of interventions, 1 of which was physical activity	Usual care	Return-to-work	Physical activity study: physical activity had no effect	AMSTAR=9 Only 1 study identified in physical activity category and quality deemed very low
Lin et al. (2011)[24]	Taiwan	10 RCTs	People with cancer	Yoga	Waitlist controls, supportive therapy	Depression, distress, stress, anxiety, overall QoL, fatigue, physical fitness	Yoga improved anxiety (p = 0.009); depression (p = 0.002); distress (p = 0.003); stress (p = 0.006). No significant effect on QoL, fatigue, or physical fitness	AMSTAR=7 Quality of included studies was low to fair
COPD								
Authors (Year)	**Location**	**# of studies**	**Population**	**Intervention**	**Comparator**	**Outcome Measures**	**Main Findings**	**AMSTAR/ Comments**
Beauchamp (2010)[25]	Canada	8 RCTs	People with COPD	Interval exercise (cycle	Continuous exercise	Peak power, peak oxygen consumption, endurance time, functional exercise capacity,	No difference between interval and continuous exercise on any outcomes measured	AMSTAR=6

				or treadmill)		HRQoL, anxiety, depression, physiological parameters, skeletal muscle adaptations, tolerance to exercise		
Thomas et al. (2010)[26]	UK	7 SRs (incl. 3 MAs)	People 18+ with severe COPD	Home-based physiotherapy (incl. inspiratory/ expiratory muscle training, exercises)	No intervention, different intervention (education), lower intensity exercise	ADL	All interventions except expiratory muscle training showed improvements in ADL. Pooled summary estimate for inspiratory muscle training showed improvement in breathlessness score by 2.36, 95% CI [0.76, 3.96]. Other outcomes too heterogeneous to pool	AMSTAR=6
Costi et al. (2009)[27]	Italy	4 RCTs	People with moderate to severe COPD	Pulmonary rehabilitation programs incl. upper-extremity exercise	Programs not aimed at improving upper-extremity exercise capacity (standard care or lower-extremity exercise)	Upper-extremity exercise capacity, dyspnea, arm fatigue or exertion, ability to perform ADL that involve arms, HRQoL	Results were inconsistent for exercise capacity, dyspnea, and HRQoL. No significant effects demonstrated for arm fatigue and ADL	AMSTAR=7 Included RCTs had serious methodological limitations
Puhan et al. (2005)[28]	Belgium	6 RCTs	People with COPD after acute exacerba-tion	Respiratory rehabilitation incl. at least physical exercise	Usual care	Hospitalizations, HRQoL, exercise capacity, mortality	Respiratory rehabilitation improved hospitalizations (RR = 0.26, 95% CI [0.12, 0.54]); mortality (RR = 0.45, 95% CI [0.22, 0.91]); HRQoL; and exercise capacity	AMSTAR=8
Puhan et al. (2009)[29]	Australia, US	9 RCTs	People with COPD after acute exacerba-tion	Pulmonary rehabilitation incl. at least physical exercise	Usual care	Primary: hospitalizations Secondary: HRQoL, exacerbations, outpatient visits, length of readmissions, mortality, functional and maximal exercise capacity, exercise endurance, withdrawals, adverse events, costs.	Pulonary rehabilitation improved hospitalizations (OR = 0.22, 95% CI [0.08, 0.58]); mortality (OR = 0.28, 95% CI [0.10, 0.84]); HRQoL; 6-MWD (MD = 77.70m, 95% CI [12.21, 143.20]); shuttle walk test (MD = 64.35, 95% CI [41.28, 87.43]). Aggregated effect estimates for other outcomes not reported. No adverse events reported	AMSTAR=9
Lacasse et al. (2006)[30]	Canada, UK	31 RCTs	People with COPD	Pulmonary rehabilitation incl. exercise therapy (+/- education and/or psychological support)	Usual care	HRQoL, maximal exercise capacity, 6-MWD, dyspnea, fatigue, emotional function, mastery	Exercise had improvements that were clinically significant for dyspnea (MD = 1.06, 95% CI [0.85, 1.26]); fatigue (MD = 0.92, 95% CI [0.71, 1.13]); emotional function (MD = 0.76, 95% CI [0.52, 1.00]); mastery (MD = 0.97, 95% CI [0.74, 1.20]); maximal exercise capacity (WMD = 8.4 watts, 95% CI [3.4, 13.4]). Improvements in 6-MWD below what is considered clinically significant	AMSTAR=9 Update of previous systematic review

TYPE 2 DIABETES								
Authors (Year)	**Location**	**# of studies**	**Population**	**Intervention**	**Comparator**	**Outcome Measures**	**Main Findings**	**AMSTAR/ Comments**
Irvine & Taylor (2009)[31]	Australia	9 RCTs	People with type 2 diabetes	Progressive resistance exercise	Aerobic exercise, flexibility training, sedentary	Primary: Percentage glycated hemoglobin. Secondary: body composition, muscle strength	Resistance exercise compared to no exercise: improved glycated hemoglobin (SMD = -0.25, 95% CI [-0.47, -0.03]); muscle strength (SMD = 0.95, 95% CI [0.58, 1.31]); no difference in body composition. Resistance exercise compared to aerobic exercise: no difference in glycated hemoglobin or body composition; strength SMD = 1.44, 95% CI [0.83, 2.05]	AMSTAR=6
Thomas et al. (2006)[32]	Australia	14 RCTs	People with type 2 diabetes	Aerobic or progressive resistance exercise (+/- diet or medication)	No intervention, diet alone, or medication alone	Primary: glycated hemoglobin, BMI, adverse events Secondary: insulin sensitivity, blood lipids, blood pressure, QoL, fitness, diabetic complication rates	Exercise improved glycated hemoglobin (-0.6%, 95% CI [-0.9, -0.3]); visceral adipose tissue (-45.5 cm2, 95% CI [-63.8, -27.3]); insulin response (131 AUC, 95% CI [20, 242]); plasma triglycerides (-0.25 mmol/L, 95% CI [0.48, -0.02]). No improvement in BMI, QoL, plasma cholesterol, blood pressure. No adverse effects reported	AMSTAR=10
Umpierre et al. (2011)[33]	Brazil	47 RCTs	People 18+ with type 2 diabetes	1.Supervised, structured exercise (aerobic +/- resistance) 2. Physical activity advice +/- dietary co-intervention	Dietary, advice, no exercise, different exercise (stretching), usual care, usual activities, education program, sedentary, exercise counseling	Glycated hemoglobin	Both structured resistance and structured aerobic exercise showed effects. Structured exercise improved glycated hemoglobin (-0.67% ,95% CI [-0.84%, -0.49%]). Physical activity advice w/o dietary co-intervention: no association with glycated hemoglobin. Physical activity advice with dietary cointervention: improved glycated hemoglobin (-0.58%, 95% CI [-0.74%, - 0.43%])	AMSTAR=6
Norris et al. (2005)[34]	US	22 RCTs	People 18+ with type 2 diabetes	Non-pharmaceutical weight loss interventions: dietary, physical activity, or behavioural	No intervention, usual care, same intervention with different intensity, other intervention	Primary: weight loss, mortality, QoL Secondary: morbidity, CVD events, glycated hemoglobin, fasting blood sugar, serum lipids, blood pressure, adverse events, cardiovascular fitness, hypertension, biliary tract diseases	No significant results for physical activity interventions	AMSTAR=10 Methodological quality of studies low to moderate

≥2 CONDITIONS								
Authors (Year)	**Location**	**# of studies**	**Population**	**Intervention**	**Comparator**	**Outcome Measures**	**Main Findings**	**AMSTAR/ Comments**
Roig et al. (2008)[35]	Canada	9 studies (7 RCTs, 1 NCT: pre/post-test, 1 case report)	People with various chronic diseases incl. COPD and CAD	Eccentric (lengthening muscle contractions) exercise	Not specified	Cardiorespiratory responses, work output, muscle mass, muscle volume, muscle strength, mitochondrial biogenesis and function, contractile phenotype, mechanical stress markers, mobility measures, rate of perceived exertion, lower extremity pain, gait, body weight distribution, serum enzyme levels, functional capacity, pain at rest and during activity, torque, muscle soreness, range of motion	Eccentric exercise appears safe and effective for some chronic conditions, but further research needed to draw conclusions due to methodological limitations in included studies such as lack of blinding or lack of intention-to-treat analysis. Aggregated effect estimates not reported	AMSTAR=7 Methodological quality of most studies was low to moderate

6-MWD = 6-Minute Walk Distance; ADL = Activities of Daily Living; BMI = Body Mass Index; CCT = Controlled Clinical Trial (non-randomized); CHD = Coronary Heart Diseases; CHF = Chronic Heart Failure; HRQoL = Health-Related Quality of Life; MA = Meta-Analysis; MD = Mean Difference; MI = Myocardial Infarction; NCT = Non-Controlled Trial (no control group) QoL = Quality of Life; SMD = Standardized Mean Difference; RCT = Randomized Controlled Trial; RR = Relative Risk; WMD = Weighted Mean Difference; WMES = Weighted Mean Effect Sizes

Methods

The goal of this evidence map was to provide an overview of the existing evidence of a particular field. Detailed search strategies were developed by an experienced Information Specialist (specific search terms available upon request). Searching was limited to the following databases:

- MEDLINE
- The Cochrane Library

Search concepts included Medical Subject Headings (MeSH) and non-thesaurus terms (i.e. text words). To be included, all citations had to have been published in 2005 or later, published in English, and be available in full text electronically. Grey literature was not included. Screening and extraction was conducted by one reviewer, and thus may have introduced a marginal amount of error. Given the publication of relevant SRs, no randomized controlled trials were considered for summary in this report. To ensure the inclusion of high quality evidence, only SRs meeting a minimum quality cutoff (as assessed by the AMSTAR instrument noted below) were included.

Risk of Bias Assessment of Systematic Reviews

AMSTAR is an 11-item measurement tool created to assess the methodological quality of systematic reviews. Each question is scored according to 1 of 4 options (yes, no, cannot answer, not applicable) and the number of 'yes' answers tallied. A higher score indicates increased methodological quality (Shea et al. 2007).[36]

The 11 assessment criteria are as follows:

1. Was an "a priori" design provided?
2. Was there duplicate study selection and data extraction?
3. Was a comprehensive literature search performed?
4. Was the status of publication (i.e. grey literature) used as an inclusion criterion?
5. Was a list of studies (included and excluded) provided?
6. Were the characteristics of the included studies provided?
7. Was the scientific quality of the included studies assessed and documented?
8. Was the scientific quality of the included studies used appropriately in formulating conclusions?
9. Were the methods used to combine the findings of studies appropriate?
10. Was the likelihood of publication bias assessed?
11. Was the conflict of interest stated?

The AMSTAR score (from 0 to 11) for each systematic review in this evidence summary is reported in the box that appears at the end of each finding. To be included, studies had to attain a minimum AMSTAR score of 6. Additionally, studies had to meet the following minimum criteria:

1. Report searching at least one database
2. Report at least one eligibility criterion
3. Report some form of quality assessment

Additional Information

This summary was produced by:
The Knowledge to Action research program, a project of the Ottawa Methods Centre at the Ottawa Hospital Research Institute, which is funded by the Canadian Institutes of Health Research [KAL-86796].

Conflict of Interest
None declared

Acknowledgements
Many thanks to Rebecca Skidmore, Information Scientist, for designing and executing the search strategies for this review and to Raymond Daniel, Information Technician, for acquiring the resources. The format of this report is based on that developed by the SUPPORT Collaboration Network www.support-collaboration.org.

This summary should be cited as
Thielman J, Konnyu K, Garritty C, Moher D. Evidence map of physical activity and exercise interventions for the treatment of chronic disease. Ottawa Hospital Research Institute; September 2011.

APPENDIX A: Excluded SRs – Studies excluded solely due to AMSTAR score less than 6 (other criteria met)

CAD/CHF								
Authors (Year)	**Location**	**# of studies**	**Population**	**Intervention**	**Comparator**	**Outcome Measures**	**Main Findings**	**AMSTAR/ Comments**
Kelley et al. (2006)[37]	US	10 RCTs	People 18+ with CVD	Aerobic exercise	No exercise	High-density lipoprotein cholesterol, low-density lipoprotein cholesterol, triglycerides	Exercise groups had a 9% increase in high-density lipoprotein cholesterol, 95% CI [1.2, 6.1mg/dL]; an 11% decrease in triglycerides 95% CI [-30.1, -8.5mg/dL]; no change in low-density lipoprotein cholesterol or total cholesterol	AMSTAR=3
Spruit et al. (2009)[38]	Nether-lands	10 trials (6 RCTs, 4 CCTs)	People with CHF	Resistance exercise	Usual care	Cardiac function, muscle strength, muscle endurance, muscle soreness, body composition, exercise capacity, QoL, respiratory strength, steady-state workload, New York Heath Association classification	Results inconclusive due to methodological limitations in studies such as lack of blinding and no intention-to-treat analysis	AMSTAR=3 Most trials had moderate to severe methodological limitations
Smart and Steele (2010)[39]	Australia	9 RCTs	People with CHF aged 53 - 75	Aerobic & resistance exercise	No exercise	Brain natriuretic peptide or N-terminal brain natriuretic peptide	Exercise improved brain natriuretic peptide (MD = -79 pg/ml, 95% CI [-141, -17]), N-terminal brain natriuretic peptide (MD = -621 pg/ml, 95% CI [-844, -398])	AMSTAR=5 All but one study used cycling as exercise
Oliveira et al. (2008)[40]	Brazil	11 RCTs	People with CAD or post heart surgery, aged 45+	Resistance exercise, +/- aerobic exercise	Different exercise or no exercise	Peripheral muscular strength and endurance, physical capacity, emotional state, QoL, oxygen uptake, cardiac outcomes, body composition, ischemic symptoms, self-efficacy, pain	Exercise improved peripheral muscular strength, physical capacity, emotional state, QoL. Mixed results for other outcomes. Aggregated effect estimates not reported	AMSTAR=3
Hwang et al. (2010)[41]	Taiwan	8 RCTs	People with CHF	Resistance exercise (+/- aerobic exercise)	No exercise or aerobic exercise alone	Cardiac function, exercise capacity, QoL	Exercise improved 6-MWD (WMD 52m, 95% CI [19, 85]), but did not improve oxygen consumption, left ventricular ejection fraction, peak oxygen consumption, or QoL	AMSTAR=5
Chien et al. (2008)[42]	Taiwan	10 RCTs	People with CHF	Home-based exercise programs	Usual care, except 1 study that used electrical stimulation	6-MWD, peak oxygen consumption, Minnesota Heart Failure Questionnaire, odds of hospitalization	Exercise improved 6-MWD (WMD = 41m, 95% CI [19, 63]); peak oxygen consumption (2.71ml/kg/min, 95% CI [0.67, 4.74]); but did not improve Minnesota Heart Failure Questionnaire or odds of hospitalization	AMSTAR=5
Cornish et al. (2010)[43]	Australia, New Zealand	7 studies (5 RCTs, 2 CCTs)	People with CAD	Exercise	Different exercise or no exercise	Cardiorespiratory fitness, endothelial function, left ventricle morphology and function	Exercise improved cardiorespiratory fitness, endothelial function, left ventricle morphology and function. Aggregated effect estimates not reported	AMSTAR=3 Methodological limitations in all studies
Iestra et al. (2005)[44]	US	22 studies (3 MAs,	People with CAD	Various dietary and	Usual care	All-cause mortality	In physical activity study: Physical activity improved all-cause mortality (RR = 0.76, 95% CI [0.59, 0.98])	AMSTAR=2 Only 1 study

		10 RCTs, 9 cohort)		lifestyle interventions, some of which were physical activity				looked at physical activity
Kozak et al. (2007)[45]	US	7 RCTs	People with CHF	Non-pharmacologic interventions, incl. exercise	Usual care	All-cause mortality, hospitalizations	In exercise study: Exercise decreased odds of hospitalization. All-cause mortality not reported for exercise study Results of exercise study depicted in forest plot, but numbers not reported separately	AMSTAR=3 Only 1 study looked at exercise
Kang-Yi and Gellis (2010)[46]	US	15 RCTs	People with heart disease	Community-based interventions (some incl. exercise)	Different intervention or different exercise intensity	Depression	Evidence was mixed. No separate conclusions for interventions incl. exercise	AMSTAR=5 Exercise included in 9 of 15 interventions
Cole et al. (2011)[47]	UK, Ireland	21 RCTs	People with CHD	Lifestyle interventions: multifactorial, educational, psychological, dietary, organizational, exercise	Usual care	Mortality, cardiovascular mortality, non-fatal cardiac events	Physical activity interventions not reported separately	AMSTAR=5
CANCER								
Authors (Year)	**Location**	**# of studies**	**Population**	**Intervention**	**Comparator**	**Outcome Measures**	**Main Findings**	**AMSTAR/ Comments**
Vrieling et al. (2010)[48]	Nether-lands	31 studies (RCTs, observational, #'s of each design not specified)	Colorectal cancer survivors	BMI, physical activity, or dietary factors	Not specified, no control groups in observational studies	Mortality (all-cause or colorectal cancer specific), colorectal cancer recurrence	Physical activity studies: Possible association between leisure-time physical activity after diagnosis on all-cause or colorectal cancer-specific mortality. No conclusive results for effect of physical activity on recurrence	AMSTAR=3 BMI, physical activity, and diet analyzed separately
Devoogdt et al. (2010)[49]	Belgium	15 studies (10 RCTs, #'s of other designs not stated)	People with arm lymphedema	Combined physical therapy intervention, 2 NCTs looked at exercise		Lymphedema and shoulder mobility, in 2 exercise studies (other outcomes in other studies)	2 exercise studies reported conflicting effects of exercise on lymphedema and shoulder mobility	AMSTAR=3

Kim et al. (2009)[50]	South Korea, US	10 studies (RCTs and CCTs, #'s of each not specified)	Women with breast cancer	Aerobic exercise	Women instructed not to modify usual behaviour, except 2 studies in which women were encouraged to participate in breast cancer discussions	Cardiopulmonary function, body composition	Exercise improved absolute peak oxygen consumption (SMD = 0.916, $p < 0.001$); relative peak oxygen consumption (SMD = 0.424, $p < 0.05$); 12-minute walk test (SMD = 0.502, $p < 0.001$); percentage body fat (SMD = -0.890, $p < 0.001$). No change in body weight or lean body mass	AMSTAR=3
Cheema et al. (2008)[51]	Canada, Australia, US, New Zealand	10 studies (5 RCTs, 1 CCT, 4 NCTs: before/ after)	People 18+ surgically treated for breast cancer	Progressive resistance exercise (+/- other exercise modalities)	No exercise for 5 RCTs. 4 NCTs had no control	Range of physiological, functional, and psychological outcome measures	Exercise improved range of physiological, functional, and psychological functions, with no adverse outcomes Aggregated effect estimates not reported	AMSTAR=5
Kirshbaum (2007)[52]	UK	29 studies (RCTs, quasi-experimen-tal, before/ after, observa-tional)	Patients during or after breast cancer treatment	Exercise (mostly aerobic)	Not specified, no control group in some designs	Range of motion, QoL, self-esteem, fatigue, locus of control, nausea, somatization, functional capacity, mood disturbance, posture, body weight, body composition, perceived health, immune system function, physical strength, physical activity, symptom inventory, aerobic capacity, cardiopulmonary outcomes, arm circumference, sleep	Post-treatment evidence showed more supporting evidence than adjuvant treatment. Strong evidence for exercise reducing fatigue. Less strong evidence for cardiopulmonary function, QoL, strength, sleep, self-esteem, weight gain, depression, anxiety, tiredness No conclusive evidence for remaining outcomes Aggregated effect estimates not reported	AMSTAR=4 Methodological quality lacking in earlier studies
Bicego et al. (2009)[53]	Canada	9 RCTs	Women with breast cancer	Physical activity and exercise (aerobic and/or resistance)	Not reported	QoL	Strong evidence that exercise positively influences QoL. Aggregated effect estimates not reported	AMSTAR=2
Cheifetz et al. (2010)[54]	Canada	21 studies (designs not stated)	Women with breast cancer	Complex decongestive therapy, patient education, exercise (range of motion or resistance exercise)	Not specified	Range of motion, lymphedema, QoL, safety, fear of activity, complications following surgery, physical fitness, self-esteem, chemotherapy completion, body composition	Complex decongestive therapy improves QoL, reduces lymphedema, but unclear effect on shoulder mobility. Exercise programs reduce lymphedema and improve range of motion, body composition, and physical fitness. Resistance exercise is safe, does not cause complications, reduces lymphedema, improves self-esteem, physical fitness, body composition, QoL, and chemotherapy completion rates. Aggregated effect estimates not reported	AMSTAR=3

Lee et al. (2010)[55]	South Korea, UK	7 studies: (3 RCTs, 4 CCTs	People (gender not specified) with breast cancer	Tai Chi alone or combined with other treatments	Different intervention or no treatment	Fatigue, QoL, movement capability, BMI, mood, activity	No effects for any outcomes in 3 RCTs. All 4 non-randomized clinical trials showed favourable effects of Tai Chi on psychological and physiological outcomes, but were prone to bias	AMSTAR=4 All 4 non-randomized trials had high risk of bias
Maddocks et al. (2009)[56]	UK	65 studies (incl. 42 RCTs, other designs not specified)	People with cancer (mostly breast)	Aerobic and/or resistance exercise program, Tai Chi, trunk stability exercises	Not specified	Uptake, adherence, completion	Exercise improved median rates of uptake by 63%, 95% CI [33, 80]; adherence by 84%, 95% CI [72, 93]; completion by 87%, 95% CI [80, 96]	AMSTAR=2
Spence et al. (2010)[57]	Australia	10 studies: NCTs: pre/post-test, CCTs, RCTs	Cancer patients with recently completed treatment and no plans for additional treatment	Aerobic exercise +/- resistance exercise	Alternative intervention or maintaining usual level of physical activity	Symptoms related to disease or treatment, QoL, fatigue, body composition, physical function, physical fitness, exercise behaviour	Improvements in several outcomes noted, but difficult to draw conclusions due to methodological limitations of included studies such as lack of blinding or intention to treat analysis	AMSTAR=5 3 studies had no control group. Methodological details lacking in most studies
Cramp et al. (2010)[58]	UK	6 RCTs	People of any age with cancer at any stage of treatment	Resistance exercise	No exercise, usual care, or alternative exercise treatment	Primary: QoL Secondary: fatigue, anxiety, depression, self-efficacy to exercise, body composition, muscle function, tumour-specific outcomes	Exercise improved QoL (SMD = -0.17, 95% CI [-0.34, -0.00]). Mixed results found for the secondary outcomes	AMSTAR=4 Individual studies do not show significant results
De Backer et al. (2009)[59]	Nether-lands	24 studies (10 RCTs, 4 CCTs, 10 NCTs not further specified)	People 18+ diagnosed for malignancy and treated with curative intention	Resistance exercise (either +/- other modalities), prescribed after chemotherapy	Not specified, 10 NCTs had no control	Physical outcome measures: body composition, cardiopulmonary function, muscle strength function	Exercise improved cardiopulmonary and muscle function, with increases in peak oxygen uptake (6-39%) and one-repetition maximum (11-110%),. No effects on body composition, endocrine and immune function, and haematological variables. Aggregated effect estimates not reported	AMSTAR=4 Studies were of moderate quality
Brown et al. (2011)[60]	U.S.	44 RCTs	People 18+ with any type of cancer	Exercise in any setting, +/- supervision	Standard care or non-exercise-related information	Patient-reported cancer-related fatigue, assessed either on its own or as part of larger questionnaire	Exercise reduced cardiorespiratory fitness (SMD = 0.31 95% CI [0.22, 0.40]). Cancer-related fatigue reduced with increasing intensity of resistance exercise	AMSTAR=5 (maybe 7 if supplementary appendix details search). Effect estimates greater in high quality studies

Van Weert et al. (2008)[61]	Nether-lands	4 MAs, 2 SRs, 29 RCTs	Cancer survivors	Physical exercise self-management rehabilitation programs	Not specified	Aerobic capacity, muscle strength, muscle fatigue, QoL	Exercise improved aerobic capacity, fatigue, and QoL in the included meta-analyses. Exercise improved muscle strength according to evidence at the RCT level only. Aggregated effect estimates not reported	AMSTAR=2 Many studies had methodological limitations
Schmitz et al. (2005)[62]	US, Canada	32 studies (85% RCTs, 15% CCTs)	Cancer survivors	Physical activity (mostly aerobic)	Different intervention or no exercise (some groups instructed not to change activity level)	Cardiorespiratory fitness, physiologic outcomes and symptoms during treatment	Physical activity improved cardiorespiratory fitness during (WMES = 0.51, $p < 0.01$) and after (0.65, $p < 0.01$) treatment; physiologic outcomes (WMES = 0.28, $p < 0.01$); and symptoms (WMES = 0.83, $p < 0.04$)	AMSTAR=2
Barbaric et al. (2010)[63]	Canada	10 prospective cohort studies	Cancer patients	Physical activity	No control group for all study designs	Cancer-related mortality	Physical activity associated with reduced risk of cancer-related mortality, especially from breast, colon, and colorectal cancers. Aggregated effect estimates not reported	AMSTAR=4
Speck et al. (2010)[64]	US, Canada	82 studies (90% RCTs, 10% non-RCTs: specific designs not specified)	People with various types of cancer	Physical activity interventions during and post treatment	Not reported (except one study where control group did stretching exercises)	Upper & lower body strength, fatigue, physical activity level, aerobic fitness, muscular strength, QoL, anxiety, self-esteem, body weight, % body fat, positive mood, BMI, confusion, body image, insulin-like growth factor 1	Post treatment physical activity improved upper (WMES = 0.99, $p < 0.0001$) and lower (WMES = 0.90, $p < 0.0001$) body strength; fatigue (WMES = -0.54, $p = 0.003$); breast cancer-specific concerns (WMES = 0.62, $p = 0.003$); and had smaller effects on physical activity level, aerobic fitness, muscular strength, QoL, anxiety, self-esteem	AMSTAR=3 WMES only calculated for 66 studies deemed high quality
Luctkar-Flude et al. (2007)[65]	Canada	19 studies (9 RCTs, 10 observational)	Older adults with cancer	Physical activity before and during treatment (aerobic and /or resistance exercise)	Usual care, relaxation training, psycho-therapy. No control group for observational study designs	Fatigue, physical functioning, QoL	Evidence suggests both aerobic exercise and resistance exercise may reduce fatigue in cancer patients during and after cancer treatment. Aggregated effect estimates not reported	AMSTAR=2 None of the included studies focused on older adults, generaliz-ability poor
Lotfi-Jam (2008)[66]	Australia	77 RCTs	People undergoing chemotherapy	Self-care strategies (incl. exercise)	Not specified	Adverse effects of chemotherapy incl. nausea and vomiting, constipation, diarrhea, fatigue, hair loss, mucositis	Exercise interventions: Severity of nausea lower. Inconsistent evidence for other outcomes. Aggregated effect estimates not reported	AMSTAR=4 Quality of RCTs generally low
Kangas et al. (2008)[67]	Australia	119 studies (57 RCTs, 62 CCTs)	People with cancer	Non-pharmacologic interventions: exercise, psychosocial	"neutral" control group	Cancer-related fatigue and associated symptoms, vigor, vitality	Exercise interventions improved cancer-related fatigue with multimodal exercise and walking programs (WMES = -0.42, $p < 0.001$)	AMSTAR=5 17 of the trials looked at exercise
Jacobsen et	US	41 RCTs	People	Non-	No intervention or	Cancer-related fatigue	Effects not significant for activity-based interventions	AMSTAR=2

al. (2007)[68]			diagnosed with cancer	pharmacological interventions: either psychological or activity-based	placebo			
Smith and Pukall (2008)[69]	Canada	10 studies (6 RCTs, 3 NCTs: study designs not further specified, 1 program evalua-tion)	People with cancer	Yoga	Waitlist, counseling, no control group for 3 NCTs	Psychological adjustment	Inconclusive results due to variability across studies and methodological problems	AMSTAR=5
Lee et al. (2007)[70]	UK, US	9 trials (4 RCTs and 5 CCTs)	People with cancer	Qi Gong (alone or combined with other treatment)	Different intervention (drug, chemo-therapy, herbal medicine, surgery, trans-catheter arterial chemoembi-lization)	Muscle strength, appetite, diarrhea, survival, health state, tumour size, QoL, mood, distress, fatigue, physical functioning, nausea	Effectiveness of Qi Gong in cancer care not yet supported by evidence	AMSTAR=5 All trials related to palliative care rather than Qi Gong as curative treatment
COPD								
Authors (Year)	**Location**	**# of studies**	**Population**	**Intervention**	**Comparator**	**Outcome Measures**	**Main Findings**	**AMSTAR/ Comments**
Lewis et al. (2007)[71]	Australia	20 (5 CCTs, 15 NCTs: study designs not further specified)	People with COPD	Breathing control with no other intervention	Not specified, no control group in 15 NCTs	Physiological outcomes, mechanistic outcomes, dyspnea, work of breathing	Breathing control improved abdominal movement (SMD 1.36, 95% CI [0.42, 2.31]); diaphragm excursion (SMD 1.39, 95% CI [1.00, 1.77]); respiratory rate (SMD -0.84, 95% CI [-1.09, -0.60]); tidal volume (SMD 0.98, 95% CI [0.71, 1.25]); arterial oxygen saturation (SMD 0.63, 95% CI [0.25, 1.02]); and percutaneous oxygen (SMD 1.48, 95% CI [0.85, 2.11]); but worsened work of breathing (SMD 1.06, 95% CI [0.52, 1.60]); and dyspnea (SMD 1.47, 95% CI [0.88,	AMSTAR=4

							2.05])	
Shoemaker et al. (2009)[72]	US	15 RCTs	People with COPD	Inspiratory muscle training	Sham intervention or no intervention	Inspiratory muscle strength and endurance, HRQoL, dyspnea, exercise tolerance	Inspiratory muscle training improved maximal inspiratory strength and endurance. Mixed results for exercise tolerance, dyspnea, and HRQoL. Aggregated effect estimates not reported	AMSTAR=3
Geddes et al. (2005)[73]	Canada	19 RCTs	People 18+ with COPD	Inspiratory muscle training (+/- target or threshold)	Sham intervention, no intervention, different mode or intensity of inspiratory muscle training	Inspiratory muscle strength and endurance, exercise capacity, work rate maximum, dyspnea, QoL, pulmonary function, ,	Compared to sham intervention, inspiratory muscle training with a target or threshold was associated with improvements in inspiratory muscle strength (WMD = 12.28, 95% CI [7.50, 17.06]); inspiratory muscle loading (WMD = 1.03, 95% CI [0.31, 1.74]); work rate maximum (WMD = 13.75, 95% CI [4.19, 23.30]); dyspnea (WMD = 3.43, 95% CI [1.91, 4.95]). Compared to no intervention, inspiratory muscle training with a target or threshold was associated with improvements in inspiratory muscle strength (WMD = 14.07, 95% CI [1.26, 26.87]). Inspiratory muscle training w/o a target or threshold did not show improvements in these outcomes. No conclusive evidence for QoL	AMSTAR=4
Crowe et al. (2005)[74]	Canada	16 RCTs	People with COPD	Inspiratory muscle training (+/- exercise and/or pulmonary rehabilitation)	Other rehabilitation techniques: exercise, education, other breathing techniques	Inspiratory muscle strength and endurance, dyspnea, QoL, exercise tolerance	Inspiratory muscle training improved inspiratory muscle strength (WMD = 12.39 cmH_2O, 95% CI [6.16, 18.22]) and inspiratory muscle endurance (WMD = 14.00 cmH_2O, 95% CI [0.20, 17.80]). Further research needed to confirm effects of both inspiratory muscle training and exercise on dyspnea, QoL, exercise tolerance	AMSTAR=5
O'Brien et al. (2005)[75]	Canada	18 RCTs	People with COPD	Inspiratory muscle training (+/- exercise or pulmonary rehabilitation)	Other interventions	Inspiratory muscle strength and endurance, exercise tolerance, dyspnea, QoL	Combined inspiratory muscle training and exercise improved maximum inspiratory muscle strength (WMD = 8.60 cmH_2O, 95% CI [2.55, 14.65]); maximum exercise tidal volume (WMD = 0.14 L, 95% CI [0.08, 0.19]); and dyspnea (WMD = -1.94, 95% CI [-2.88, -1.01]). No improvements in other outcomes for combined intervention. No improvements for any outcomes for inspiratory muscle training alone	AMSTAR=5 Update of previous systematic review
Janaudis et al. (2009)[76]	Canada	5 RCTs	People with COPD	Arm training program	Different exercise (lower extremity exercise), or	Arm exercise capacity, dyspnea during ADL, HRQoL, symptoms of dyspnea during arm exercise tests	Arm exercise improves arm exercise capacity, but effects on dyspnea, arm fatigue, and HRQoL are unclear.	AMSTAR=5 Variation in exercise

					unspecified		Aggregated effect estimates not reported	programs between trials
O'Shea et al. (2009)[77]	Australia	18 trials (14 RCTs, 4 CCTs)	People with COPD	Peripheral progressive resistance exercise	Aerobic exercise, usual activities, physician home visit, or not stated	Body structure and function, activity, participation	Short-term progressive resistance exercise moderately improves muscle strength in knee extensors (SMD = 0.52, 95% CI [0.30, 0.74]); leg press (SMD = 0.96, 95% CI [0.26, 1.66]); and latissimus dorsi strength (SMD = 0.53, 95% CI [0.05, 1.01]). Effects on other outcomes inconclusive due to bias	AMSTAR=5 Update of previous SR
Houchen et al. (2009)[78]	UK	3 RCTs	People with COPD	Resistance exercise	Usual care, regular activity level,	Whether benefits of exercise last in the long-term	2 studies found benefits still evident after 12 weeks and 12 or 6 months. 1 study found no difference between exercise and control groups	AMSTAR=4 Only 3 studies identified, so can't draw conclusions
Smidt et al. (2005)[79]	Nether-lands	45 SRs	People with various chronic conditions, incl. COPD	Exercise therapy, incl. aerobic and strengthening exercises	Different exercise (endurance training), or unspecified	Variety of outcomes as reported in SRs, incl. maximum and functional exercise capacity and QoL	For COPD, exercise therapy improves maximum and functional exercise capacity and QoL. Aggregated effect estimates not reported	AMSTAR=3
Puhan et al. (2005)[80]	Switzer-land	15 RCTs	People with COPD	Various exercise modalities (strength vs. endurance, interval vs. continuous, high intensity vs. low intensity)	Different exercise modality (strength vs. endurance, interval vs. continuous, high intensity vs. low intensity)	HRQoL	Strength exercise led to greater improvements in HRQoL than endurance exercise (WMD 0.27, 95% CI 0.02, 0.52). Insufficient evidence on relative effectiveness of interval vs. continuous or high vs. low intensity exercise	AMSTAR=4 Quality of studies was low to moderate
Coventry and Hind (2007)[81]	UK	6 RCTs	People 18+ with COPD	Pulmonary rehabilitation incl. exercise	Usual care or education alone	Primary: anxiety, depression Secondary: HRQoL (generic and disease-specific)	3 studies showed pulmonary rehabilitation reduced short-term anxiety (SMD = -0.33, 95% CI [-0.57, -0.09]); depression (SMD = -0.58, 95% CI [-0.93, -0.23]); disease-specific HRQoL; generic HRQoL. Education alone was not associated with reductions in anxiety or depression. Studies with long-term follow-up data showed short-term gains in all outcomes were not sustained	AMSTAR=5
Beauchamp et al. (2011)[82]	Canada	5 RCTs	People with COPD	Longer duration pulmonary rehabilitation	Shorter duration pulmonary rehabilitation	HRQoL, exercise capacity	3 trials reported improved HRQoL in longer duration program. 2 trials reported improved exercise capacity in longer duration program. Aggregated effect estimates not reported due to	AMSTAR=5 Limited number of included studies prevents

				incl. exercise			heterogeneity in program duration and outcomes	definitive conclusions
Lacasse et al. (2007)[83]	Canada	31 RCTs	People with COPD	Respiratory rehabilitation: exercise therapy (+/- education and/or psychological support)	Usual care	HRQoL, maximal and functional exercise capacity	Exercise effect on HRQoL larger than minimal clinically important difference, effect on exercise capacity was small and slightly below what is clinically important	AMSTAR=4
Marciniuk et al. (2010)[84]	Canada, US	5 studies (3 RCTs, 1 MA, 1 non-inferiority trial)	People with COPD	Pulmonary rehabilitation	Not specified	Dyspnea, HRQoL, 6-MWD, respiratory muscle strength, arm muscle strength, cycling endurance	Pulmonary rehabilitation benefits COPD patients. Hospital and non-hospital based programs produce similar results. Aggregated effect estimates not reported	AMSTAR=3 Guideline based on SR
Langer et al. (2009)[85]	Belgium, Nether-lands, Brazil	103 studies (5 MAs, 84 RCTs, 14 NCTs: not further specified)	People with COPD	Variety of recommenda-tions, incl. exercise	Not specified	Dyspnea, mucus clearance, physical activity behaviour, HRQoL, functional exercise capacity	Physical exercise improves HRQoL, functional exercise capacity. Inconclusive evidence of effect on dyspnea, mucus clearance, and physical activity behaviour change. Aggregated effect estimates not reported	AMSTAR=0 *guideline based on SR, tables with info. not included
Wilt et al. (2007)[86]	US	74 studies (63 RCTs + 11 MAs	People with COPD	Variety of therapies, incl. pulmonary rehabilitation	Placebo, drug, sham exercise, lower intensity exercise, different exercise, oxygen	HRQoL, exercise capacity, exacerbations, deaths, respiratory health status, hospitalizations, adverse effects	Pulmonary rehabilitation improved health status and dyspnea, but not walking distance (other outcomes reported for non-exercise therapies). Aggregated effect estimates not reported for pulmonary rehabilitation	AMSTAR=4
TYPE 2 DIABETES								
Authors (Year)	**Location**	**# of studies**	**Population**	**Intervention**	**Comparator**	**Outcome Measures**	**Main Findings**	**AMSTAR/ Comments**
Kelley and Kelley (2007)[87]	US	7 RCTs	People with type 2 diabetes	Aerobic exercise	Not specified	Total cholesterol, high-density lipoprotein cholesterol, triglycerides	Exercise reduced low-density lipoprotein cholesterol (MD = -6.4%, 95% CI [-11.8, -1.1]) and glycated hemoglobin (MD = -0.4%, 95% CI [-0.8, 0.0]), but not total cholesterol, high-density lipoprotein cholesterol, or triglycerides	AMSTAR=4
Gordon et al. (2009)[88]	Australia	20 studies, #'s not specified (24 papers	People 18+ with type 2 diabetes	Resistance exercise +/_ supervision of exercise	Sedentary or not specified	Glycemic control, insulin sensitivity	Supervised resistance exercise improved glycemic control and insulin sensitivity. Compliance decreased in unsupervised exercise. Further research required to confirm.	AMSTAR=5

		reporting on the 20 studies, incl. 13 RCTs, 8 CCTs, 3 NCTs)intervention studies					Aggregated effect estimates not reporeted	
Conn et al. (2007)[89]	US	103 studies (#'s of different designs not reported)	People with type 2 diabetes	Exercise	Not specified, some study designs had no control groups	Glycated hemoglobin	Exercise improved glycated hemoglobin (MWES = 0.29-0.34)	AMSTAR=3
Kavookjian et al. (2007)[90]	US	41 studies (5 SRs, 2, technical reviews, 18 RCTs, 9 CCTs, 7 NCTs: pre/post-test)	People with type 1 or type 2 diabetes	Various types of physical activity and exercise	Not specified, no control group in pre/post-test study designs	Learning, behaviour change, clinical outcomes, health status outcomes, economic outcomes	For type 2 diabetes, exercise improved glycemic control and cardiovascular risk, but effect on behavioural and health status outcomes unclear Aggregated effect estimates not reported	AMSTAR=4
Huisman et al. (2009)[91]	Nether-lands	34 RCTs	People with type 2 diabetes	Weight reduction interventions (incl. exercise)	Not specified	Weight loss, glycated hemoglobin	Overall effects on weight loss were low (weighted average SMD = 0.08, 95% CI [0.03,0.14]), but were higher for glycated hemoglobin (weighted average SMD = 0.35, 95% CI [0.21,0.49])	AMSTAR=4
Aljasir et al. (2010)[92]	Canada	5 RCTs	People with type 2 diabetes	Yoga (+/- other intervention)	Different intervention or usual care	Primary outcomes: Fasting plasma glucose, glycated hemoglobin Secondary outcomes: BMI, lipid profiles, diabetes complications	Not enough evidence for definitive recommendations due to ranges in study quality and intervention characteristics. Results were more conclusive for short-term than long-term outcomes, showing evidence of benefit for short-term outcomes. Aggregated effect estimates not reported due to heterogeneity between studies	AMSTAR=5
Innes and Vincent (2007)[93]	US	25 trials (4 RCTs, 6 CCTs, 15 NCTs: pre/post-	People with type 2 diabetes	Yoga	Drugs, supplements, different intensity exercise, no intervention,	Glucose tolerance, insulin sensitivity, lipid profiles, anthropometric characteristics, blood pressure, oxidative stress, coagulation profiles, sympathetic activation, pulmonary function, specific clinical outcomes, diabetes	Yoga improved glucose tolerance, insulin sensitivity, lipid profiles, anthropometric characteristics, blood pressure, oxidative stress, coagulation profiles, sympathetic activation, pulmonary function, specific clinical outcomes.	AMSTAR=2 Limitations characterized most studies and prevent firm

		test)			dietary, usual care, education, no control groups in 15 NCTs	risk profiles, cardiovascular complications	Inconclusive evidence for improved diabetes risk profiles and cardiovascular complications. Ranges of individual study effects reported, but aggregated effect estimates not reported	conclusions
Lee et al. (2008)[94]	South Korea	5 trials (2 RCTs, 3 CCTs)	People with type 2 diabetes	Tai Chi	No treatment, sham exercise, other interventions	Change in fasting blood glucose, glycated hemoglobin	No convincing evidence that Tai Chi reduces fasting blood glucose or glycated hemoglobin	AMSTAR=4
Lee et al. (2009)[95]	South Korea, US, UK	9 studies (3 RCTs, 1 CCT, 5 observa-tional)	People with type 2 diabetes	Qi Gong	Varied: Usual care, drug treatment, no treatment	Glycated hemoglobin, blood glucose, insulin sensitivity	Favourable effects of Qi Gong on glycated hemoglobin, 2hr plasma glucose, insulin sensitivity, blood viscosity. Aggregated effect estimates not reported	AMSTAR=2 Quality of studies was poor, so insufficient evidence for Qi Gong
≥2 CONDITIONS								
Authors (Year)	**Location**	**# of studies**	**Population**	**Intervention**	**Comparator**	**Outcome Measures**	**Main Findings**	**AMSTAR/ Comments**
Karmi-sholt and Gotzshe (2005)[96]	Denmark	17 SRs	People with various chronic diseases incl. CAD, CHF, COPD, type 2 diabetes, and others	Physical activity involving the whole body (aerobic)	No exercise or lower intensity exercise	All-cause mortality, walking time, disability, peak oxygen consumption, QoL, HRQoL, dyspnea, fatigue, 6-MWD	Physical activity improved all-cause mortality in CAD patients (OR 0.73, 95% CI [0.54, 0.98]. Physical activity improved on CHF, COPD, type 2 diabetes, but needs confirmation in other trials	AMSTAR=1
Herring et al. (2010)[97]	US	40 RCTs	Sedentary people with various chronic illnesses (CVD, MS, fibromyal-gia, COPD, cancer, etc)	Exercise intervention	No exercise	Anxiety measured at baseline and after exercise	Exercise reduced anxiety symptoms by mean effect of 0.29, 95% CI [0.23, 0.36)	AMSTAR=2
Taylor et al. (2007)[98]	Australia	38 SRs	People with neurological, musculo-skeletal, cardio-pulmonary, and other conditions	Exercise as part of physiotherapy	No treatment	Impairment, activity limitations, participation restriction	Exercise improved conditions incl. CHF, CVD, and COPD. Aggregated effect estimates not reported	AMSTAR=2
Ng and Tsang	Hong Kong	26 RCTs	People of any age with	Qi Gong	Usual care, placebo, no	Immune cell counts, blood lipids, blood pressure, cardiac function, ventilatory	Qi Gong had some effects on increasing white blood cell count (WMD = 0.32, 95% CI [0.09,0.56]),	AMSTAR=5 Major

(2009)[99]			chronic conditions (cancer, hypertension, pain, etc.)		treatment	function, pain, mood	lymphocyte count (WMD = 0.32, 95% CI [0.08,0.33]), stroke volume (WMD = 10.86, 95% CI [10.33,11.39]), peak early transmitral filling velocity (WMD = 8.20, 95% CI [7.56,8.84]), late transmitral filling velocity (WMD = 2.42, 95% CI [1.92,2.92]), forced vital capacity volume (WMD = 0.50, 95% CI [0.44,0.56]), forced expiratory volume (WMD = 0.27, 95% CI [0.22,0.33]), and decreasing total cholesterol (WMD = 0.34, 95% CI [0.34, -0.29]), systolic blood pressure (WMD = 3.93, 95% CI [4.76,3.19]), diastolic blood pressure (WMD = 4.99, 95% CI [5.42,4.56]), depressive mood	methodological limitations in most studies

6-MWD = 6-Minute Walk Distance; ADL = Activities of Daily Living; BMI = Body Mass Index; CCT = Controlled Clinical Trial (non-randomized); CHD = Coronary Heart Diseases; CHF = Chronic Heart Failure; HRQoL = Health-Related Quality of Life; MA = Meta-Analysis; MD = Mean Difference; MI = Myocardial Infarction; NCT = Non-Controlled Trial (no control group) QoL = Quality of Life; SMD = Standardized Mean Difference; RCT = Randomized Controlled Trial; RR = Relative Risk; WMD = Weighted Mean Difference; WMES = Weighted Mean Effect Sizes

APPENDIX B: Excluded SRs – Studies excluded for reasons in addition to poor reporting (may also have AMSTAR < 6)

REASON FOR EXCLUSION	AUTHORS (YEAR)
Different type of SR (review includes irrelevant study types such as pilot studies and cost effectiveness studies)	Kuchinski et al. (2009)[100]
Comparators represent different population than intervention groups	Bartlo (2007)[101] Korczak et al. (2010)[102] Lirussi (2010)[103]
Population includes people who do not already have chronic disease	Yeh et al. (2009)[104] Lee et al. (2007)[16] Wang et al. (2009)[105] Angermayr et al. (2010)[106]
Population includes children	Liu et al. (2009)[107] Wolin et al. (2010)[108]

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