NKR10. PICO 4 Rehabilitering af KOL. Resistance training versus endurance training for COPD

Characteristics of studies

Characteristics of included studies

Covey 2014

Methods	**Study design:** Randomized controlled trial **Study grouping:** Crossover
Participants	**Baseline Characteristics** Intervention 1 ● *COPD severity (GOLD/MRC)*: 42 (10) FEV1, % predicted ● *Male (%)*: 18/2 (male/female) ● *Age (range)*: 68 (9) age, years Intervention 2 ● *COPD severity (GOLD/MRC)*: ● *Male (%)*: ● *Age (range)*: Control ● *COPD severity (GOLD/MRC)*: 39 (9) FEV1, % predicted ● *Male (%)*: 25/2 (male/female) ● *Age (range)*: 68 (7) age, years Overall ● *COPD severity (GOLD/MRC)*: ● *Male (%)*: ● *Age (range)*: **Included criteria:** The eligibility criteria included:forced expiratory volume in one second (FEV1)/forced vitalcapacity0.7 and FEV1 55% predicted, age > 45 years,and currently in stable clinical condition (eg, no exacer-bations within two months of enrollment or recent changein medical therapy).
Interventions	**Intervention Characteristics** Intervention 1 ● *Description*: Resistance training was performed with fitness equip-ment (Body-Solid Inc., Forest Park, IL, United States ofAmerica) using 6 lifts: leg press, knee extension, kneeflexion, calf raise, hip adduction, and hip abduction.Training was initiated at an intensity of 70% of the onerepetition maximum (1RM) performed at baseline with atraining volume of 2 sets of 8e10 repetitions for 2 weeks,followed by 2 weeks of training at 80% of the baseline 1RMat a volume of 2 sets. For the remaining 4 weeks the in-tensity was 80% of the 1RM (re-assessed after 4 weeks oftraining) at a volume of 3 sets of 8e10 repetitions ● *Length (weeks)*: 8 weeks pr intervention ● *Longest follow-up (after end of treatment)*: 16 weeks after start of treatment Intervention 2 ● *Description*: ● *Length (weeks)*: ● *Longest follow-up (after end of treatment)*: Control ● *Description*: Aerobic training was performed on a stationary cycleergometer, calibrated with a 4 kg weight (Monark 828E,Varberg, Sweden) using an interval training protocol. Forthe interval training protocol patients performed four worksets of five minutes duration separated by rest intervals ofunloaded cycling lasting 2e4 min. This approach lessenssymptoms of dyspnea and fatigue during training[8]andenables even extremely dyspneic patients to train at pro-gressively higher intensities without stopping or reducingtraining intensity. The initial work sets were at 50% of thepeak work rate and were evaluated weekly with progressiveincreases targeted to achieve the highest work rate toler-ated[9]. The typical progression was: 50% peak work ratefor weeks 1e2, 60% peak work rate for weeks 3e4, 70%peak work rate for weeks 5e6, and 80% peak work rate forweeks 7e8 ● *Length (weeks)*: 8 weeks pr intervention ● *Longest follow-up (after end of treatment)*: 16 weeks after start of treatment
Outcomes	*Quality of life, SD* ● **Outcome type**: ContinuousOutcome *Dropouts, n* ● **Outcome type**: DichotomousOutcome *ADL, SD* ● **Outcome type**: ContinuousOutcom *Muscle strength, SD* ● **Outcome type**: ContinuousOutcome *Walk test, SD* ● **Outcome type**: ContinuousOutcome

Notes	**Sponsorship source:** The source of support for this research was The NationalInstitute of Nursing Research R01-NR10249 and theDepartment of Veterans Affairs, United States of America.The contents of this paper are solely the responsibility ofthe authors and do not necessarily represent the officialviews of the National Institutes of Health or the Depart-ment of Veterans Affairs. **Country:** USA **Comments:** ClinicalTrials.gov: NCT01058213 **Authors name:** Margaret K. Covey **Institution:** Department of Biobehavioral Health Science, University of Illinois at Chicago, Chicago, IL,United States **Email:** mkcovey@uic.edu, margaretcovey@gmail.com **Address:** University of Illinois at Chicago, Department of Biobehavioral Health Science, M/C 802, 845 S. Damen Avenue,Chicago, IL 60612, United States. **Outcomes** Drop-out: Intervention 1 is RT-then-AT group. 11 dropped-out. unknown if this was during RT or AT. Control is CE-then-AT group. 7 dropped out. Unknown is this was during sham (CE) or during AT.ADL: CHAMPS. Intervention, data taken after 8 weeks. Control, data taken after 16 weeksMuscle strength: measured by 1 RM. Intervention, data taken after 8 weeks. Control, data taken after 16 weeksWalk test: 6-min test. Intervention, data taken after 8 weeks. Control, data taken after 16 weeks

Risk of bias table

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Randomization to group was stratified by gender (strata: male, female) and disease severity (strata: FEV 1 30%e55% predicted, FEV 1 < 30% predicted) with a software program (biased coin algorithm to ensure equivalent groups) [7]." Quote: "(biased coin algorithm to ensure equivalent groups)" Judgement Comment: Unknown how it was done
Allocation concealment (selection bias)	Unclear risk	Quote: "Randomization to group was stratified by gender (strata: male, female) and" Judgement Comment: Unknown if groups were concealed
Blinding of participants and personnel (performance bias)	Unclear risk	Quote: "patients were not informed of the intent of the three group research design or the expected outcomes of the study." Judgement Comment: Unknown if personnel was blinded
Blinding of outcome assessment (detection bias) QoL	Low risk	Quote: "Data collectors were blinded to group assignment"
Blinding of outcome assessment (detection bias) Exercise tests	Unclear risk	Nothing stated
Incomplete outcome data (attrition bias)	Unclear risk	Judgement Comment: There are the same number of patients who dropped out during training. Yet it is not explained during which type of training the dropout took place (cross-over design)
Selective reporting (reporting bias)	Low risk	Judgement Comment: Study matches protocol
Other bias	Low risk	No other apparent sources of bias

Dourado 2009

Methods	RCT
Participants	51 randomised, 13 drop outs, RT=11, ET=13, CT=11
Interventions	12 weeks of 3 different training programs
Outcomes	walking test(6MWT), HRQoL(SGRQ), muscle strength, C-P exercise tests
Notes	

Risk of bias table

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	not stated
Allocation concealment (selection bias)	Unclear risk	not stated
Blinding of participants and personnel (performance bias)	High risk	not blinded
Blinding of outcome assessment (detection bias) QoL	Unclear risk	not stated
Blinding of outcome assessment (detection bias) Exercise tests	Unclear risk	
Incomplete outcome data (attrition bias)	High risk	large drop out almost 1/3, we can not extract baseline data, only the numbers of drop outs available
Selective reporting (reporting bias)	Low risk	not detected
Other bias	Low risk	not detected

Iepsen 2016

Methods	**Study design:** Randomized controlled trial **Study grouping:** Parallel group
Participants	**Baseline Characteristics** Intervention 1 ● *COPD severity (GOLD/MRC)*: 57 (12) FEV1, % of predicted ● *Male (%)*: 40% ● *Age (range)*: 65 (7) age (years) Intervention 2 ● *COPD severity (GOLD/MRC)*: ● *Male (%)*: ● *Age (range)*: Control ● *COPD severity (GOLD/MRC)*: 55 (17) FEV1, % of predicted ● *Male (%)*: 47% ● *Age (range)*: 60 (9) age (years) Overall ● *COPD severity (GOLD/MRC)*: 56 (14) FEV1, % of predicted ● *Male (%)*: 43% ● *Age (range)*: 63 (8) age (years) **Included criteria:** Eligibility criteria for participants were forced expiratory volume in 1second/forced vital capacity ratio □0.7, forced expiratory volume in 1second □80% of predicted, Modified Medical Research Council score □2, resting arterial oxygenation □90%, and age between 40 and 80years. **Excluded criteria:** Exclusion criteria were claudication, severe heart failure, unstable ischemic heart disease, and malignant diseases. Spirometry (Model 2120; Vitalograph Ltd., Buckingham, UK) and a general medical examination were performed prior to inclusion. **Pretreatment:** There were no differences between groups in lung function, BMI, age
Interventions	**Intervention Characteristics** Intervention 1 ● *Description*: Resistance training (RT) was performed on machines (Technogym, Cesena, Italy) and consisted of 4 sets of strength exercises of major upper and lower body muscle groups (chest press, rowing, leg press, and leg extension). The load was initially set at 30% of one repetition maximum and increased to 40% of one repetition maximum. Each exercise included 4 sets with a duration of 30seconds that allowed for 15–20 repetitions to be completed. There was a 20-second break between sets and a 60-second break between exercises. Subjects were instructed to maintain muscle tension at all times during sets. Workload (kilograms) was registered for all sessions, and intensity increased accordingly. The balance between set duration and rest allowed for muscular fatigue to be induced with a moderate load. As load was adjusted regularly to keep sets within the targeted repletion range, the relative training intensity was kept uniform among subjects. ● *Length (weeks)*: 8 weeks, 35min, 3 times a week ● *Longest follow-up (after end of treatment)*: After end of treatment Intervention 2 ● *Description*: ● *Length (weeks)*: ● *Longest follow-up (after end of treatment)*: Control ● *Description*: Endurance training (ET) was performed at moderate intensity adjusted indi-vidually to level 14–15 on the Borg scale of perceived exertion. The training sessions included either cycling on an ergometer or walking on a treadmill. The workload (Watts and distance) for each session was registered, and participants were instructed to increase exercise intensity progressively. ● *Length (weeks)*: 8 weeks, 35min, 3 times a week ● *Longest follow-up (after end of treatment)*: After end of treatment
Outcomes	*Quality of life, SD* ● **Outcome type**: ContinuousOutcome *Dropouts, n* ● **Outcome type**: DichotomousOutcome *Walk test, SD* ● **Outcome type**: ContinuousOutcome
Notes	**Sponsorship source:** The Centre for Physical Activity Research (CFAS) is supported by a grant from TrygFonden. During the study period, the Centre of Inflammation and Metabolism (CIM) was supported by a grant from the Danish National Research Foundation (DNRF55). The study was further supported by grants from the Axel Muusfeldts Foundation, the Capital Region of Denmark, and the Novo Nordisk Foundation. CIM/CFAS is a member of DD2 – the Danish Center for Strategic Research in Type 2 Diabetes (the Danish Council for Strategic Research, grant nos 09-067009 and 09-075724) **Country:** Denmark **Comments:** Registered at Clinicaltrials.gov (NCT02050945) **Authors name:** Ulrik Winning Iepsen **Institution:** The Centre of Inflammation and Metabolism and the Centre for Physical Activity Research, Rigshospitalet, University of Copenhagen, Denmark **Email:** ulrik_winning@hotmail.com

	Address: The Centre of Inflammation and Metabolism and the Centre for Physical activity research, rigshospitalet, University of Copenhagen, Blegdamsvej 9, 2100 Copenhagen, Denmark **Outcomes** Quality of life, SD: CAT score, fully reported. Range 0-40Dropouts: lost to follow-up (not at the end of treatment), fully reported. In RT training; 1 due to exacerbation and 1 due to neck pain during trainingWalk test: 6-min test, fully reported

Risk of bias table

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "A computer-generated random allocation sequence was per- formed," Judgement Comment: computer-generated random allocation sequence was performed
Allocation concealment (selection bias)	Low risk	Quote: "A computer-generated random allocation sequence was per- formed, and" Judgement Comment: Sequentially numbered opaque sealed envelopes were given to participants after inclusion and baseline testing
Blinding of participants and personnel (performance bias)	Low risk	Quote: "sequentially numbered opaque sealed envelopes were given to the participants after inclusion and baseline tests." Quote: "The researcher who enrolled participants and analyzed data was blinded to the training intervention. Sample size was"
Blinding of outcome assessment (detection bias) QoL	Low risk	No other apparent sources of bias
Blinding of outcome assessment (detection bias) Exercise tests	Low risk	Quote: "The researcher who enrolled participants and analyzed data was blinded to the training intervention. Sample" Judgement Comment: The researcher who enrolled participants and analyzed data was blinded to the training intervention
Incomplete outcome data (attrition bias)	Low risk	Judgement Comment: Study matches protocol
Selective reporting (reporting bias)	Low risk	No other apparent sources of bias
Other bias	Low risk	No other apparent sources of bias

Normandin 2002

Methods	RCT
Participants	54 randomised, 14 drop outs (7 in each group) RT=20, ET=20
Interventions	8 weeks of training, ET or RT
Outcomes	HRQoL(CRQ), ADL, C-P exercise tests, exacerbations
Notes	

Risk of bias table

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	not reported
Allocation concealment (selection bias)	Unclear risk	not stated
Blinding of participants and personnel (performance bias)	High risk	not blinded
Blinding of outcome assessment (detection bias) QoL	High risk	not blinded
Blinding of outcome assessment (detection bias) Exercise tests	Unclear risk	
Incomplete outcome data (attrition bias)	Low risk	14 of 54 droped out
Selective reporting (reporting bias)	Low risk	not detected
Other bias	Low risk	none detected

Ortega 2002

Methods	RCT
Participants	54 randomised, 7 dropouts, RT=17, ET=16, CT=14
Interventions	12 weeks of training
Outcomes	HRQoL(CRQ), walking test(SWT), muscle strength, C-P exercise test
Notes	

Risk of bias table

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	not stated
Allocation concealment (selection bias)	Unclear risk	not stated
Blinding of participants and personnel (performance bias)	High risk	blinding not possible

Blinding of outcome assessment (detection bias) QoL	Unclear risk	not stated
Blinding of outcome assessment (detection bias) Exercise tests	Unclear risk	
Incomplete outcome data (attrition bias)	Low risk	small drop out
Selective reporting (reporting bias)	Low risk	not detected
Other bias	Low risk	none detected

Skumlien 2008

Methods	RCT
Participants	40 randomised, RT=20 ET=20
Interventions	12 weeks of training
Outcomes	HRQoL(SGRQ), 6MWT, muscle strength, C-P exercise test, exacerbations, mortality at 1 year follow up
Notes	

Risk of bias table

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	High risk	Allocated alternately upon inclusion
Allocation concealment (selection bias)	High risk	not consealed
Blinding of participants and personnel (performance bias)	High risk	not blinded
Blinding of outcome assessment (detection bias) QoL	Unclear risk	not stated
Blinding of outcome assessment (detection bias) Exercise tests	Unclear risk	
Incomplete outcome data (attrition bias)	Low risk	2 drop outs
Selective reporting (reporting bias)	Low risk	not detected
Other bias	Low risk	none detected

Spruit 2002

Methods	RCT
Participants	48 randomised, 18 dropout, RT=24 ET=24
Interventions	12 weeks of training
Outcomes	HRQoL(CRQ), 6MWT, muscle strength, C-P exercise test, exacerbations
Notes	

Risk of bias table

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	not reported
Allocation concealment (selection bias)	Low risk	consealed envelops
Blinding of participants and personnel (performance bias)	High risk	not blinded
Blinding of outcome assessment (detection bias) QoL	High risk	not blinded
Blinding of outcome assessment (detection bias) Exercise tests	Low risk	blinded
Incomplete outcome data (attrition bias)	High risk	many drop outs
Selective reporting (reporting bias)	Low risk	not detected
Other bias	Low risk	none detected

Vonbank 2011

Methods	RCT
Participants	43 randomised, 7 dropout, RT=12 ET=12 CT=12
Interventions	12 weeks of training
Outcomes	HRQoL(SGRQ), muscle strength, C-P exercise test, exacerbations
Notes	

Risk of bias table

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	not reported
Allocation concealment (selection bias)	Unclear risk	not reported
Blinding of participants and personnel (performance bias)	High risk	blinding not possible
Blinding of outcome assessment (detection bias) QoL	Unclear risk	
Blinding of outcome assessment (detection bias) Exercise tests	Unclear risk	not stated
Incomplete outcome data (attrition bias)	Unclear risk	7 of 43 randomised dropped out, but all due to exacerbations. Not clear from which groups
Selective reporting (reporting bias)	Low risk	not detected
Other bias	Low risk	none detected

Wurtemberger 2001

Methods	RCT (paper in German)
Participants	69 randomised. Subgroups: with and without supplemental oxygen
Interventions	ET or RT or RT+ET
Outcomes	6MWT, C-P exercise test, ADL? (taken from Puhan 2005)
Notes	

Risk of bias table

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	not described
Allocation concealment (selection bias)	Unclear risk	not described
Blinding of participants and personnel (performance bias)	High risk	not described
Blinding of outcome assessment (detection bias) QoL	Unclear risk	
Blinding of outcome assessment (detection bias) Exercise tests	Unclear risk	not described
Incomplete outcome data (attrition bias)	Unclear risk	not described
Selective reporting (reporting bias)	Unclear risk	not described
Other bias	Unclear risk	not described

Footnotes

Characteristics of excluded studies

Footnotes

Characteristics of studies awaiting classification

Footnotes

Characteristics of ongoing studies

Footnotes

Summary of findings tables

Additional tables

References to studies

Included studies

Covey 2014

[Empty]

Dourado 2009

[Empty]

Iepsen 2016

[Empty]

Normandin 2002

[Empty]

Ortega 2002

[Empty]

Skumlien 2008

[Empty]

Spruit 2002

[Empty]

Vonbank 2011

[Empty]

Wurtemberger 2001

[Other:]

[Empty]

Excluded studies

Studies awaiting classification

Ongoing studies

Other references

Additional references

Other published versions of this review

Classification pending references

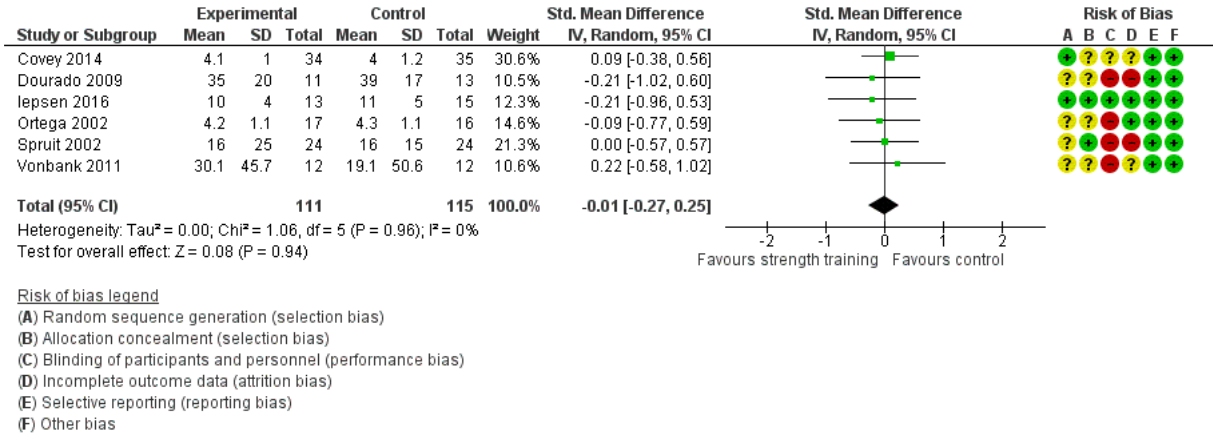
Data and analyses

1 Strength training versus endurance training. final and change combined

Outcome or Subgroup	Studies	Participants	Statistical Method	Effect Estimate
1.1 Quality of life. End of treatment. Change. (CQR+CAT+SGRQ))	6	226	Std. Mean Difference (IV, Random, 95% CI)	-0.01 [-0.27, 0.25]
1.3 Walking test. End of treatment. (6MWT)	6	240	Mean Difference (IV, Random, 95% CI)	-8.73 [-26.90, 9.44]
1.5 Leg strength. End of treatment. Change. (MVC Knee extensor+1RM)	5	190	Std. Mean Difference (IV, Fixed, 95% CI)	0.36 [0.06, 0.65]
1.7 ADL. End of treatment. Change (Glitre ADL-test, alltagsmotorischer Fertigkeiten)	3	136	Std. Mean Difference (IV, Random, 95% CI)	0.26 [-0.17, 0.68]
1.9 Drop-out. End of treatment	5	217	Risk Ratio (M-H, Random, 95% CI)	1.26 [0.78, 2.01]

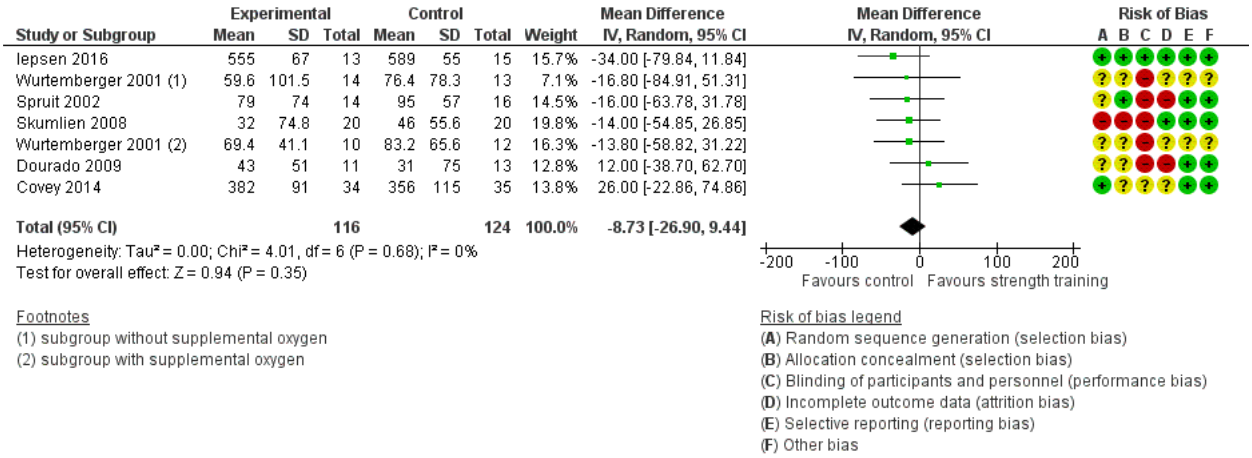
Figures

Figure 1 (Analysis 1.1)



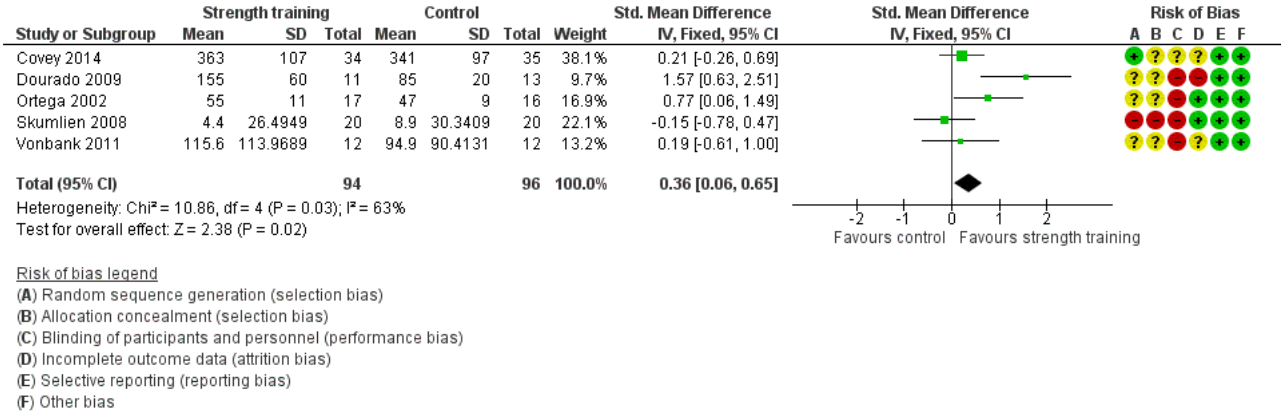
Forest plot of comparison: 1 Strength training versus endurance training. final and change combined, outcome: 1.1 Quality of life. End of treatment. Change. (CQR+CAT+SGRQ)).

Figure 3 (Analysis 1.3)



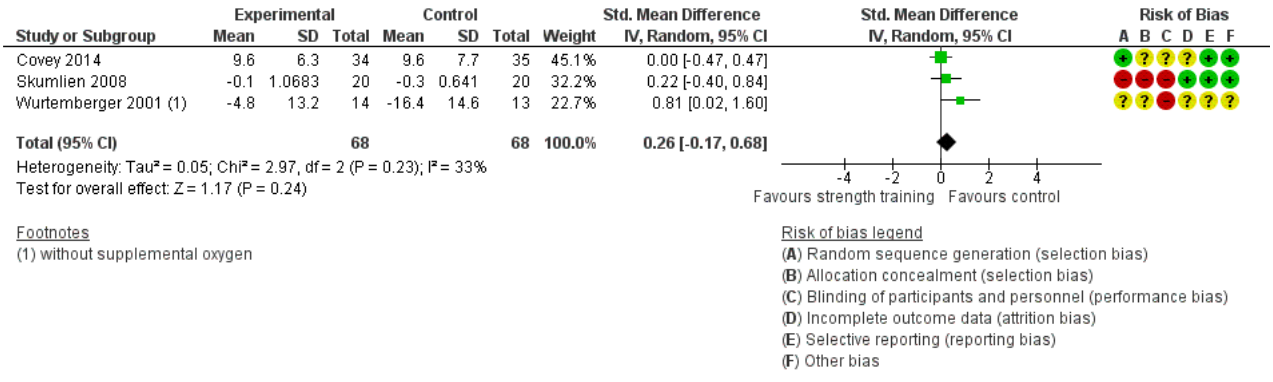
Forest plot of comparison: 1 Strength training versus endurance training, outcome: 1.3 Walking test. End of treatment. (6MWT).

Figure 5 (Analysis 1.5)



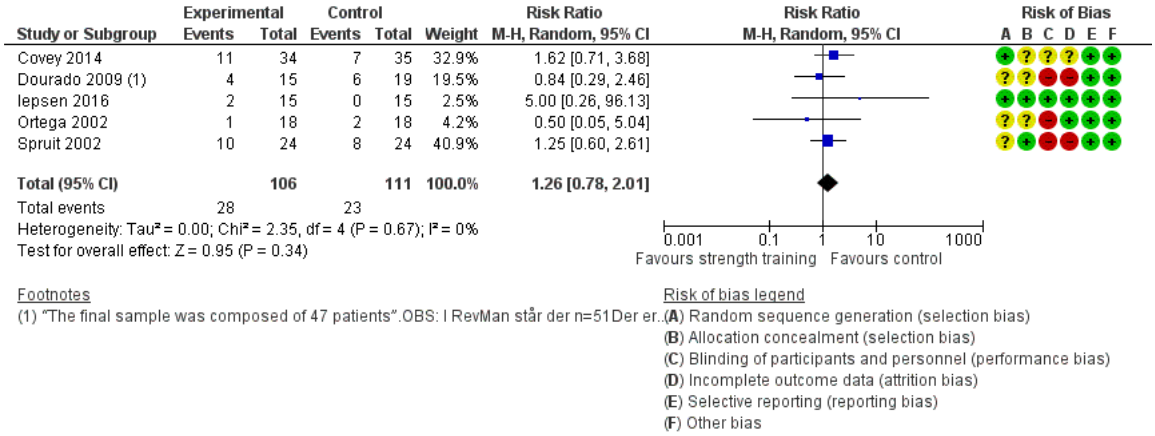
Forest plot of comparison: 1 Strength training versus endurance training. final and change combined, outcome: 1.5 Leg strength. End of treatment. Change. (MVC Knee extensor+1RM).

Figure 8 (Analysis 1.7)



Forest plot of comparison: 1 Strength training versus endurance training, outcome: 1.7 ADL. End of treatment. Change (Glitre ADL-test, alltagsmotorischer Fertigkeiten).

Figure 9 (Analysis 1.9)



Forest plot of comparison: 1 Strength training versus endurance training, outcome: 1.9 Drop-out. End of treatment.