PICO 1

Characteristics of studies

Characteristics of included studies

Abbott 2013

Methods	
Participants	
Interventions	
Outcomes	
Identification	
Notes	

Risk of bias table

Bias	Authors' judgement	Support for judgement
Sequence Generation	Low risk	RoB er taget Fra SR Fransen 2014
Incomplete outcome data	Low risk	
Allocation concealment	Low risk	
Blinding of participants and personnel	High risk	
Blinding of outcome assessors	Unclear risk	n
Selective outcome reporting	Low risk	
Other sources of bias	Unclear risk	n

Fernandes 2010

Methods	
Participants	
Interventions	
Outcomes	
Identification	
Notes	

Risk of bias table

Bias	Authors' judgement	Support for judgement
Sequence Generation	Low risk	Fransen et al. 2014
Incomplete outcome data	Low risk	
Allocation concealment	Low risk	
Blinding of participants and personnel	High risk	Physiotherapists and participants aware of treatment allocation
Blinding of outcome assessors	Unclear risk	Blinded outcomes assessor, but participant self reported pain and function
Selective outcome reporting	Low risk	
Other sources of bias	Low risk	

French 2013

Methods	
Participants	
Interventions	
Outcomes	
Identification	

Notes	

Risk of bias table

Bias	Authors' judgement	Support for judgement
Sequence Generation	Low risk	RoB er taget Fra SR Fransen 2014
Incomplete outcome data	Low risk	
Allocation concealment	Low risk	
Blinding of participants and personnel	High risk	
Blinding of outcome assessors	Unclear risk	n
Selective outcome reporting	Low risk	
Other sources of bias	Low risk	

Juhakoski 2011

Methods	
Participants	
Interventions	
Outcomes	
Identification	
Notes	

Risk of bias table

Bias	Authors' judgement	Support for judgement
Sequence Generation	Low risk	RoB er taget Fra SR Fransen 2014
Incomplete outcome data	Low risk	
Allocation concealment	Low risk	
Blinding of participants and personnel	High risk	
Blinding of outcome assessors	Unclear risk	n
Selective outcome reporting	Unclear risk	n
Other sources of bias	Low risk	

Oosting 2012

Methods	**Study design:** Randomized controlled trial **Study grouping:** Parallel group **Open Label:** **Cluster RCT:**
Participants	**Baseline Characteristics** Intervention ● *Beskrivelse*: ● *Female gender (%)*: 93 ● *Chair rise time (sec)*: 47.5 sec Control ● *Beskrivelse*: ● *Female gender (%)*: 67 ● *Chair rise time (sec)*: 32.7 sec **Included criteria:** Inclusion criteria were (1) elective THA (mini mum waiting period of 3wk), (2) OA as underlying diagnosis for THA, (3) age older than 65 years, and (4) a score of 2 or higher on the frailty index Identification of Seniors At Risk (ISAR) **Excluded criteria:** Exclusion criteria were (1) unable to understand Dutch, (2) inadequate cognitive functioning (ie, not able to understand instructions), (3) revision of THA, and (4) diagnosed with dementia or severe heart disease.

	Pretreatment: More females in the intervention group compared to control (93% versus 97%).Higher (slower) Chair rise time at baseline in intervention group compared to control (47.5 versus 32.7 sec)
Interventions	**Intervention Characteristics** Intervention ● *Exercise description*: Functional activities and walking capacity. ● *Exercise dose (intensity, frequency, duration)*: Moderate intensity (55-75% of max, 11-13 on Borg scale). Intensity + repetitions progressively increased over time. 30 min/sessions twice a week for 3-6 weeks. Additional 4 times/week home-based exe ● *Supervised sessions*: 6-12 sessions. Twice a week for 3-6 weeks. Median of 7 (range 5-8) sessions received. Control ● *Exercise description*: Usual care, single group session 3 weeks before surgery. They received information about the operation, walkingwith crutches, and exercises that would be performed in thepostoperative phase. ● *Exercise dose (intensity, frequency, duration)*: None ● *Supervised sessions*: None
Outcomes	*Patientrapporteret funktionsevne* ● **Outcome type**: ContinuousOutcome ● **Reporting**: Fully reported ● **Scale**: HOOS function ● **Range**: 0-100 ● **Unit of measure**: Points ● **Direction**: Lower is better ● **Data value**: Endpoint ● **Notes**: Converted scale *Præstationsbaseret funktionsevne* ● **Outcome type**: ContinuousOutcome ● **Reporting**: Fully reported ● **Scale**: Chair rise stand ● **Unit of measure**: Seconds ● **Direction**: Lower is better ● **Data value**: Endpoint ● **Notes**: Unknown number of repetitions

	Smerte (hofte) ● **Outcome type**: ContinuousOutcome ● **Reporting**: Fully reported ● **Scale**: HOOS Pain ● **Range**: 0-100 ● **Unit of measure**: Points ● **Direction**: Lower is better ● **Data value**: Endpoint ● **Notes**: Converted scale *Helbredsrelatered livskvalitet* ● **Outcome type**: ContinuousOutcome ● **Reporting**: Fully reported ● **Scale**: HOOS QOL ● **Range**: 0-100 ● **Unit of measure**: Points ● **Direction**: Lower is better ● **Data value**: Endpoint ● **Notes**: Converted scale *Træningsinducerede skader* ● **Outcome type**: AdverseEvent ● **Reporting**: Not reported *Smerte (ikke hofterelateret)* ● **Outcome type**: AdverseEvent ● **Reporting**: Not reported
Identification	**Sponsorship source:** Supported by the Scientific College Physical Therapy of the Royal Dutch Societyfor Physical Therapy **Country:** The Netherlands **Setting:** **Comments:** **Authors name:** Oosting, 2012

	Institution: **Email:** **Address:**
Notes	

Risk of bias table

Bias	Authors' judgement	Support for judgement
Sequence Generation	Low risk	Quote: "Randomization took place after stratification by age (65–70y and age 70y), using prepared envelopes per stratum. Within each stratum a permuted block randomization with a block size of 10 was used."
Incomplete outcome data	Low risk	Judgement Comment: Low drop out rates
Allocation concealment	Low risk	Judgement Comment: Concealed by permuted blocks
Blinding of participants and personnel	High risk	Judgement Comment: Not possible
Blinding of outcome assessors	Low risk	Judgement Comment: Blinded outcome assessors
Selective outcome reporting	Low risk	Judgement Comment: None apparent, pilot study
Other sources of bias	Low risk	Judgement Comment: None apparent

Teirlinck 2016

Methods	**Study design:** Randomized controlled trial **Study grouping:** Parallel group **Open Label:** **Cluster RCT:**
Participants	**Baseline Characteristics** Intervention ● *Beskrivelse*:

	Control ● *Beskrivelse*: **Included criteria:** Patients were eligible if they were aged 45 years, and sufferedfrom a new episode of non-traumatic hip complaints fulfilling theclinical criteria for hip OA of the American College of Rheumatology(ACR) **Excluded criteria:** Exclusion criteria:- exercise therapy in the past 3 months;- hip pain score <2 on an 11-point numeric rating scale (NRS:0 ¼ no pain);- high level of physical function (score of <2 on the AlgofunctionalIndex)13,- hip surgery or on waiting list;- disabling co-morbidity (e.g., severe heart failure);- insufficient comprehension of the Dutch language;- mentally incapable of participation **Pretreatment:**
Interventions	**Intervention Characteristics** Intervention ● *Exercise description*: Exercises consisted of strengthening and improving flexibility ofmuscles around the hip joint (especially extensors and abductors),leg and abdominal muscles. Aerobic exercises to improve endurancewere also included. Passive treatment forms were not allowed. Patients were expected to perform home exercises and were provideda booklet describing the exercises ● *Exercise dose (intensity, frequency, duration)*: 30 minutes, 1/week during 3 months ● *Supervised sessions*: Target max 12 sessions + 2 booster sessions. Median 8 sessions received Control ● *Exercise description*: GP care could include education, counselling, prescriptionof pain medication, additional diagnostic tests or referral to an orthopedicsurgeon. In the control group, referral to a physical therapistwas discouraged, but was not restricted ● *Exercise dose (intensity, frequency, duration)*: ● *Supervised sessions*: Unknown
Outcomes	*Patientrapporteret funktionsevne* ● **Outcome type**: ContinuousOutcome ● **Reporting**: Fully reported ● **Scale**: HOOS ADL ● **Range**: 0-100 ● **Unit of measure**: Points ● **Direction**: Lower is better ● **Data value**: Endpoint

- **Notes**: Obs konverteret skala - lower is better

Præstationsbaseret funktionsevne

- **Outcome type**: ContinuousOutcome
- **Reporting**: Not reported
- **Unit of measure**: seconds
- **Direction**: Lower is better
- **Data value**: Endpoint

Smerte (hofte)

- **Outcome type**: ContinuousOutcome
- **Reporting**: Fully reported
- **Scale**: HOOS Pain
- **Range**: 0-100
- **Unit of measure**: Points
- **Direction**: Lower is better
- **Data value**: Endpoint
- **Notes**: Converted scale

Helbredsrelatered livskvalitet

- **Outcome type**: ContinuousOutcome
- **Reporting**: Fully reported
- **Scale**: EQ-5D
- **Range**: -0.329-1
- **Unit of measure**: Points
- **Direction**: Higher is better
- **Data value**: Endpoint

Træningsinducerede skader

- **Outcome type**: AdverseEvent
- **Reporting**: Not reported
- **Data value**: Endpoint

Smerte (ikke hofterelateret)

- **Outcome type**: AdverseEvent
- **Reporting**: Not reported

Identification	**Sponsorship source:** Netherlands Organization for Health Research and Development(Health Care Efficiency Research Program), Dutch Arthritis Foundation, the NetherlandsOrganization for Health Research and Development, Fonds Nuts Ohra, the European Union, Dutch Arthritis Foundatio and personal fees from Biomedis International LTD (Japan). **Country:** The Netherlands **Setting:** **Comments:** **Authors name:** Teirlinck, 2016 **Institution:** **Email:** **Address:**
Notes	

Risk of bias table

Bias	Authors' judgement	Support for judgement
Sequence Generation	Low risk	Quote: "For the random allocation sequence (allocation ratio 1:1) a computer-generated random table was used, provided by an in- dependent person. Block randomization was used with random blocks of 4, 6 and 8 patients."
Incomplete outcome data	Low risk	Judgement Comment: Low drop out rates and intention-to-treat analysis performed
Allocation concealment	Low risk	Quote: "Based on the randomization list, opaque, sealed, sequentially numbered envelopes were prepared by an independent person. In this way the member of the research team was blinded for treatment allocation."
Blinding of participants and personnel	High risk	Quote: "Blinding for subsequent treatment of patient, of care provider and researcher during follow-up was not possible due to the intervention of interest."
Blinding of outcome assessors	Low risk	Judgement Comment: Only patient-reported outcomes are used
Selective outcome reporting	Low risk	Judgement Comment: Pre-registered trial and changes to trial since protocol are described
Other sources of bias	Low risk	Judgement Comment: None apparent

van Baar 1998

Methods	
Participants	
Interventions	
Outcomes	
Identification	
Notes	

Risk of bias table

Bias	Authors' judgement	Support for judgement
Sequence Generation	Low risk	
Incomplete outcome data	Low risk	
Allocation concealment	Low risk	
Blinding of participants and personnel	High risk	
Blinding of outcome assessors	Unclear risk	n
Selective outcome reporting	Unclear risk	n
Other sources of bias	Low risk	

Villadsen 2014

Methods	**Study design:** Randomized controlled trial **Study grouping:** Parallel group **Open Label:** **Cluster RCT:**

Participants	**Baseline Characteristics** Intervention ● *Beskrivelse*: Control ● *Beskrivelse*: **Included criteria:** Eligible patients were at least 18 years of age and scheduledfor primary unilateral total hip or knee replacement at the SvendborgHospital, Odense University Hospital, Denmark, because of symptomaticOA **Excluded criteria:** Exclusion criteria were current or previous fractures in or adjacent tothe joint, inflammatory arthritis and comorbidity diseases, e.g., severe heartdisease and neurological deficits, making exercise and testing impossible.Patients were not included if scheduled for bilateral TJR in the sameprocedure or for geographic reasons, e.g., living on adjacent islands withlogistics making frequent attendance unrealistic **Pretreatment:**
Interventions	**Intervention Characteristics** Intervention ● *Exercise description*: Neuromusculat training (NEMEX-TJR) + Standard preoperative information as control group ● *Exercise dose (frequency, duration, progression)*: 1 hour twice a week for 8 weeks, Individualization is possiblethrough progression of the level of difficulty of each exercise based on thequality of the performance evaluated by the supervising physiotherapist. ● *Number of exercise session with/without supervision*: 16-18 supervised sessions Control ● *Exercise description*: Standard preoperative information including exercise leaflet ● *Exercise dose (frequency, duration, progression)*: None ● *Number of exercise session with/without supervision*: None
Outcomes	*Patientrapporteret funktionsevne* ● **Outcome type**: ContinuousOutcome ● **Reporting**: Fully reported ● **Scale**: HOOS ADL ● **Range**: 0-100 ● **Unit of measure**: Points ● **Direction**: Higher is better

- **Data value**: Change from baseline

Præstationsbaseret funktionsevne

- **Outcome type**: ContinuousOutcome
- **Reporting**: Fully reported
- **Scale**: Chair stand test (5 rep)
- **Unit of measure**: Seconds
- **Direction**: Lower is better
- **Data value**: Change from baseline

Smerte (hofte)

- **Outcome type**: ContinuousOutcome
- **Reporting**: Fully reported
- **Scale**: HOOS Pain
- **Range**: 0-100
- **Unit of measure**: Points
- **Direction**: Higher is better
- **Data value**: Change from baseline

Helbredsrelateret livskvalitet

- **Outcome type**: ContinuousOutcome
- **Reporting**: Fully reported
- **Scale**: HOOS QOL
- **Range**: 0-100
- **Unit of measure**: Points
- **Direction**: Higher is better
- **Data value**: Change from baseline

Træningsinducerede skader

- **Outcome type**: AdverseEvent
- **Reporting**: Partially reported

Smerte (ikke hofterelateret)

- **Outcome type**: AdverseEvent
- **Reporting**: Not reported

Identification	**Sponsorship source:** Tryg Fonden (number7-10-0094). Protesekompagniet, a private Danish corporation supplying orthopedic equipment, funded the exercise machines used for patient assessments. The Parker Institute is supported by grants from the Oak Foundation.A. Villadsen is co-owner of the Danish company Ther-ex (34595208), which produces an exercise application. **Country:** Denmark **Setting:** **Comments:** **Authors name:** Villadsen **Institution:** **Email:** **Address:**
Notes	

Risk of bias table

Bias	Authors' judgement	Support for judgement
Sequence Generation	Low risk	Judgement Comment: Using sequentially numbered, opaque, sealed envelopes produced by a person not otherwise involved in the trial.
Incomplete outcome data	Low risk	Judgement Comment: Low drop out rates + intention-to-treat analysis
Allocation concealment	Low risk	Judgement Comment: Allocation concealed by opaque, sealed envelopes, block randomisation in groups of 4. Instruction to patients concerning not to reveal their group assignment to assessors.
Blinding of participants and personnel	High risk	Judgement Comment: Not possible to blind
Blinding of outcome assessors	Low risk	Judgement Comment: Blinded assessment + blinded analysis
Selective outcome reporting	Low risk	Judgement Comment: None apparent, pre-registered trial
Other sources of bias	Low risk	

Footnotes

References to studies

Included studies

Abbott 2013

Published and unpublished data

[Empty]

Fernandes 2010

L. Fernandes yz*, K. Storheimyz, L. Sandvik x, L. Nordsletten k{, M.A. Risberg yz#.

French 2013

[Empty]

Juhakoski 2011

Published and unpublished data

[Empty]

Oosting 2012

Oosting E.; Jans M.P.; Dronkers J.J.; Naber R.H.; Dronkers-Landman C.M.; Appelman-De,Vries S.; Van,Meeteren N.. Preoperative home-based physical therapy versus usual care to improve functional health of frail older adults scheduled for elective total hip arthroplasty: A pilot randomized controlled trial. Archives of Physical Medicine and Rehabilitation 2012;93(4):610-616. [DOI:]

Teirlinck 2016

Teirlinck C.H.; Luijsterburg P.A.J.; Dekker J.; Bohnen A.M.; Verhaar J.A.N.; Koopmanschap M.A.; van,Es P.; Koes B.W.; Bierma-Zeinstra S.M.A.. Effectiveness of exercise therapy added to general practitioner care in patients with hip osteoarthritis: A pragmatic randomized controlled trial. Osteoarthritis and Cartilage 2016;24(1):82-90. [DOI:]

van Baar 1998

[Empty]

Villadsen 2014

Villadsen A.; Overgaard S.; Holsgaard-Larsen A.; Christensen R.; Roos E.M.. Immediate efficacy of neuromuscular exercise in patients with severe osteoarthritis of the hip or knee: A secondary analysis from a randomized controlled trial. Journal of Rheumatology 2014;41(7):1385-1394. [DOI:]

Data and analyses

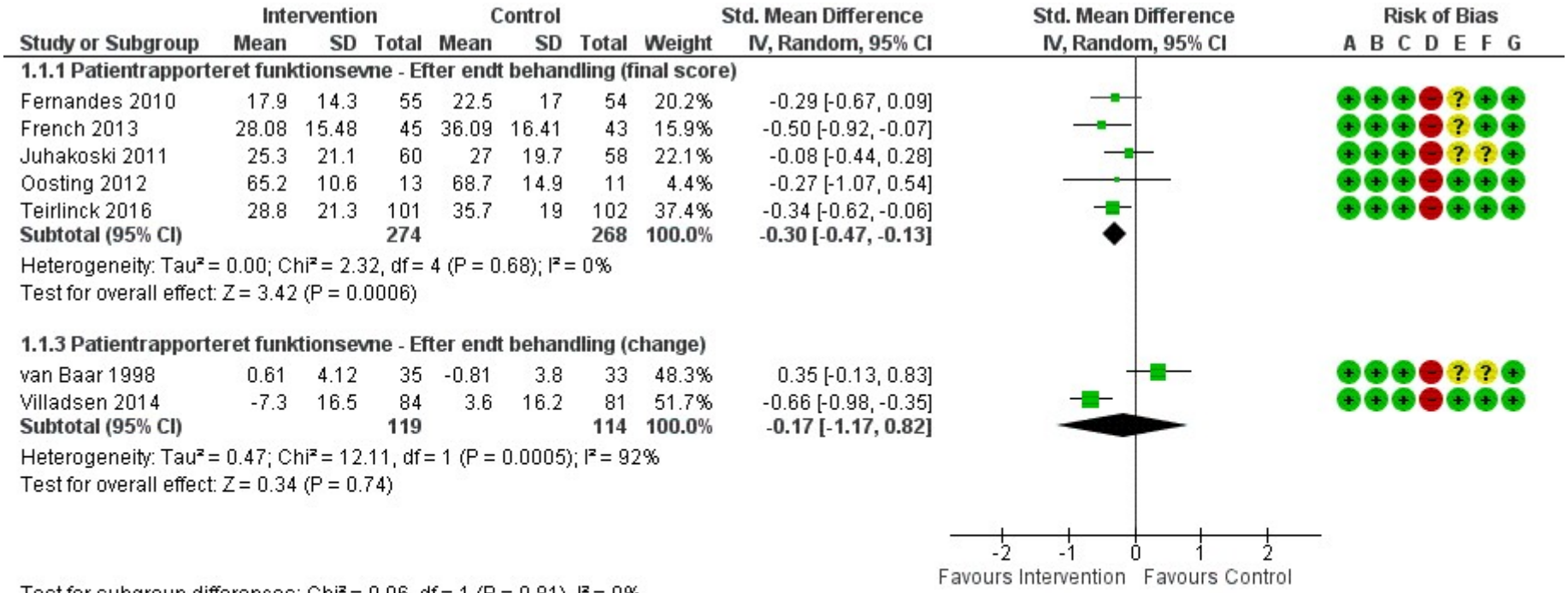
1 Intervention vs Control

Outcome or Subgroup	Studies	Participants	Statistical Method	Effect Estimate
1.1 Patientrapporteret funktionsevne - Efter endt behandling	7		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
1.1.1 Patientrapporteret funktionsevne - Efter endt behandling (final score)	5	542	Std. Mean Difference (IV, Random, 95% CI)	-0.30 [-0.47, -0.13]
1.1.3 Patientrapporteret funktionsevne - Efter endt behandling (change)	2	233	Std. Mean Difference (IV, Random, 95% CI)	-0.17 [-1.17, 0.82]
1.2 Patientrapporteret funktionsevne - Langtidseffekt (6-12 mdr)	4		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
1.2.1 Patientrapporteret funktionsevne - Langtidseffekt (6-12 mdr) (final score)	3	337	Std. Mean Difference (IV, Random, 95% CI)	-0.39 [-0.60, -0.17]
1.2.2 Patientrapporteret funktionsevne - Langtidseffekt (6-12 mdr) (change)	1	65	Std. Mean Difference (IV, Random, 95% CI)	-0.07 [-0.56, 0.42]
1.3 Præstationsbaseret funktionsevne	2		Mean Difference (IV, Random, 95% CI)	Subtotals only
1.3.2 Præstationsbaseret funktionsevne - Efter endt behandling (change)	2	191	Mean Difference (IV, Random, 95% CI)	-5.64 [-16.66, 5.39]

1.4 Smerte (hofte) final score	6		Mean Difference (IV, Random, 95% CI)	Subtotals only
1.4.1 Smerteniveau - hofterelateret (Efter endt behandling - final score)	6	614	Mean Difference (IV, Random, 95% CI)	-6.27 [-10.53, -2.00]
1.5 Smerte (hofte) change	1		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
1.5.2 Smerteniveau - hofterelateret (Efter endt behandling - change)	1	165	Mean Difference (IV, Fixed, 95% CI)	8.40 [3.97, 12.83]
1.6 Helbredsrelateret livskvalitet (final score)	4		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
1.6.1 Helbredsrelateret livskvalitet Efter endt behandling (final score)	4	426	Std. Mean Difference (IV, Random, 95% CI)	0.04 [-0.15, 0.23]
1.7 Helbredsrelateret livskvalitet - change	1		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
1.7.2 Helbredsrelateret livskvalitet Efter endt behandling (change)	1	165	Mean Difference (IV, Fixed, 95% CI)	-4.90 [-10.03, 0.23]

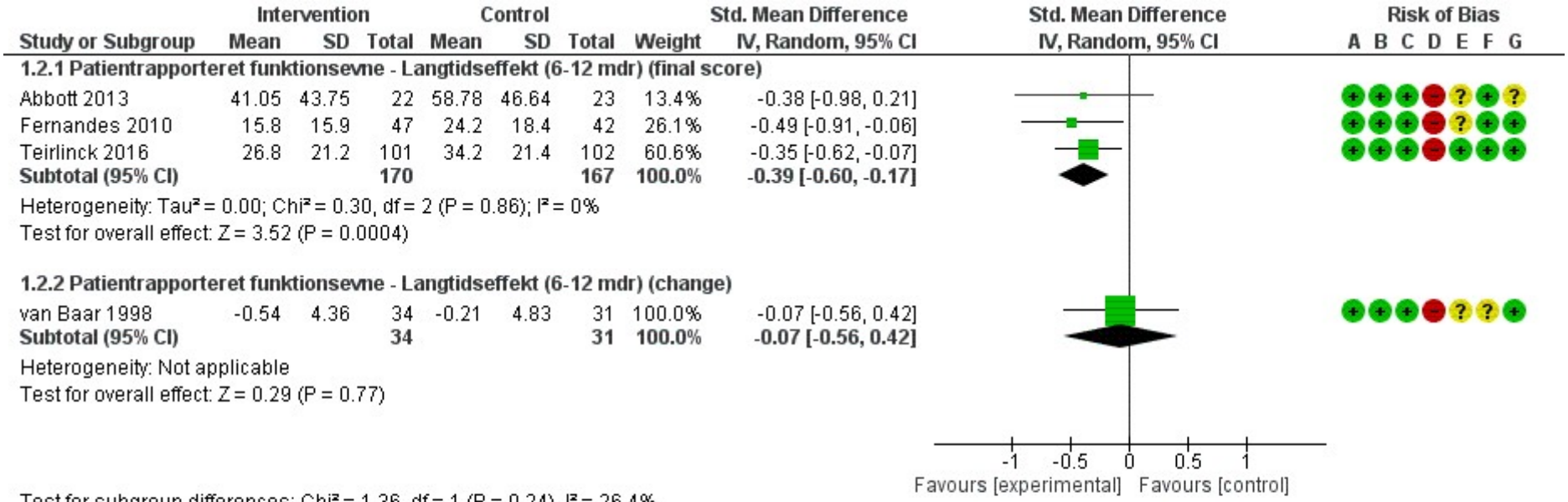
Figures

Figure 1 (Analysis 1.1)



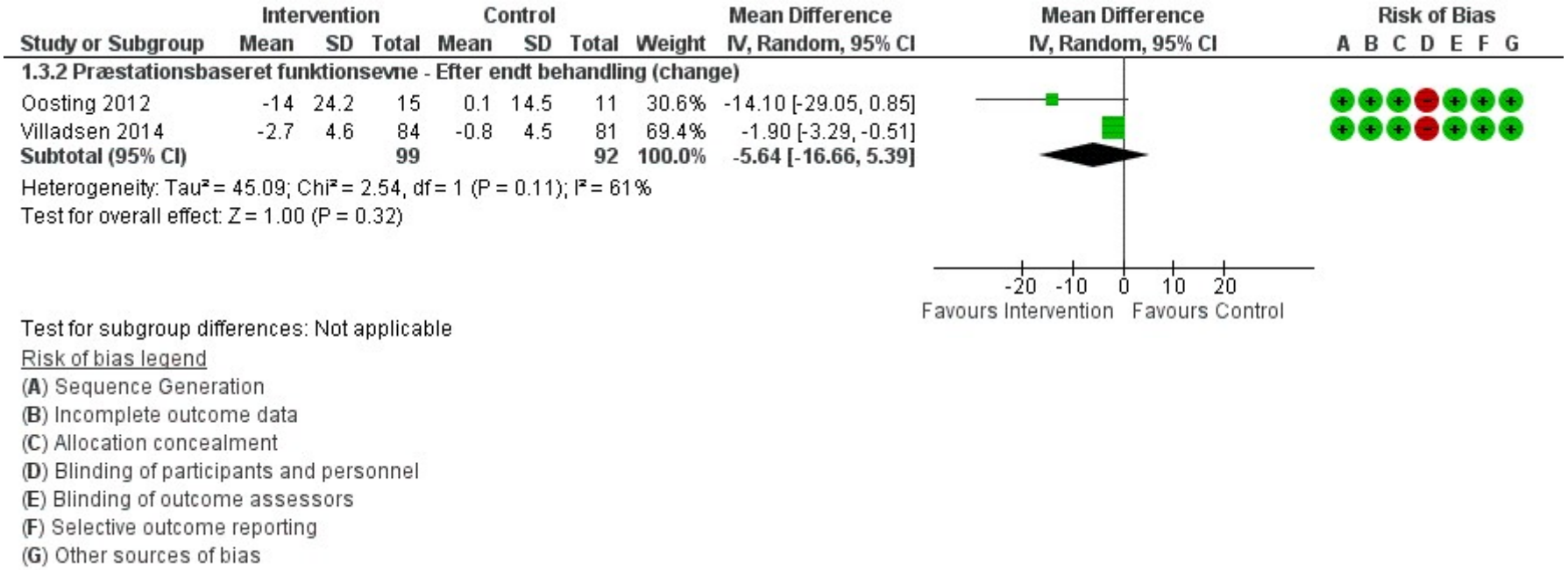
Forest plot of comparison: 1 Intervention vs Control, outcome: 1.1 Patientrapporteret funktionsevne - Efter endt behandling.

Figure 2 (Analysis 1.2)



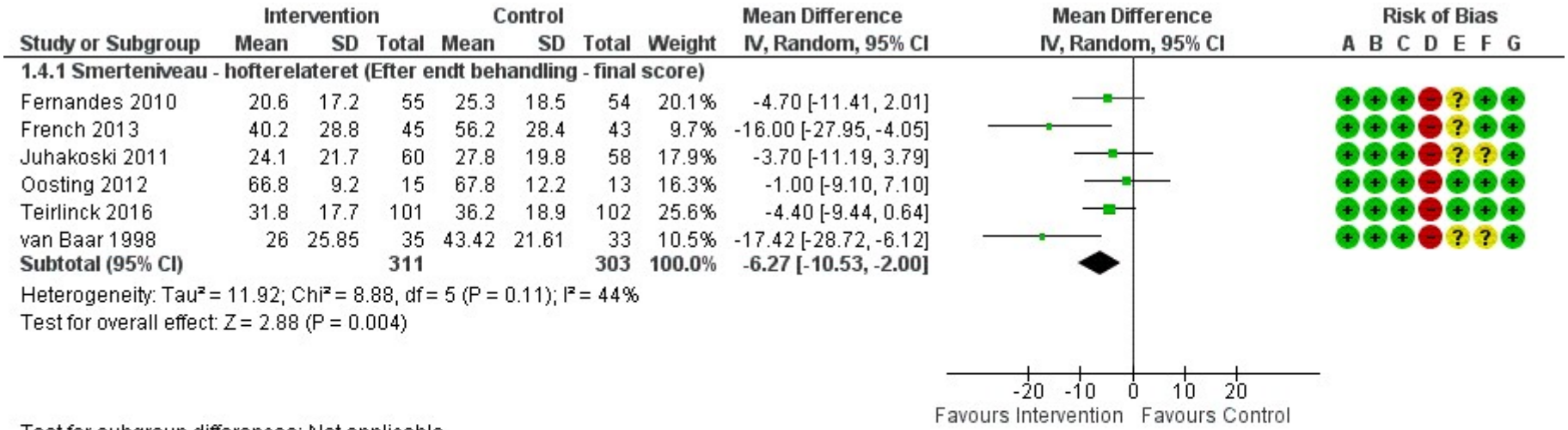
Forest plot of comparison: 1 Intervention vs Control, outcome: 1.2 Patientrapporteret funktionsevne - Langtidseffekt (6-12 mdr).

Figure 3 (Analysis 1.3)



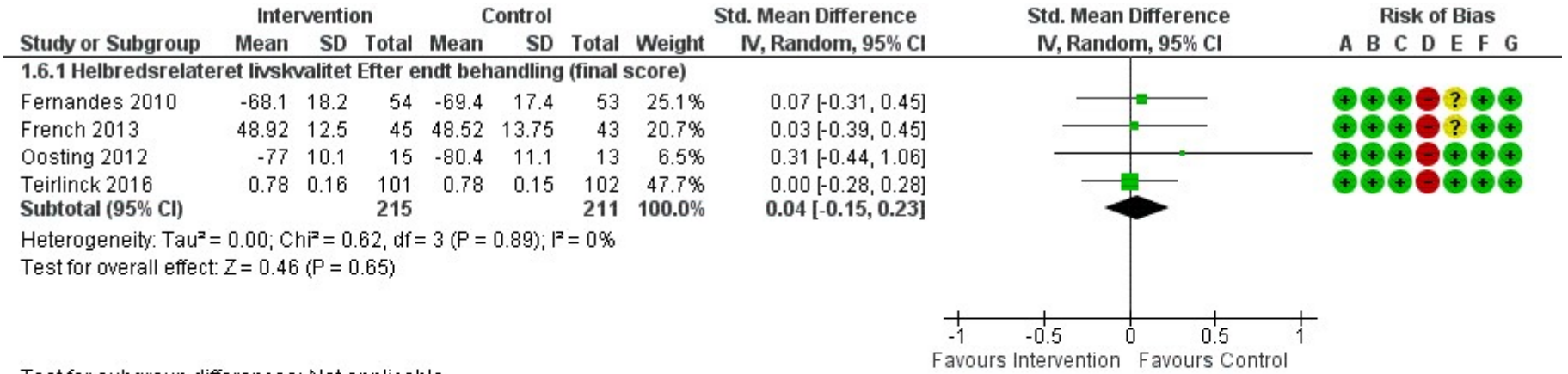
Forest plot of comparison: 1 Intervention vs Control, outcome: 1.3 Præstationsbaseret funktionsevne.

Figure 4 (Analysis 1.4)



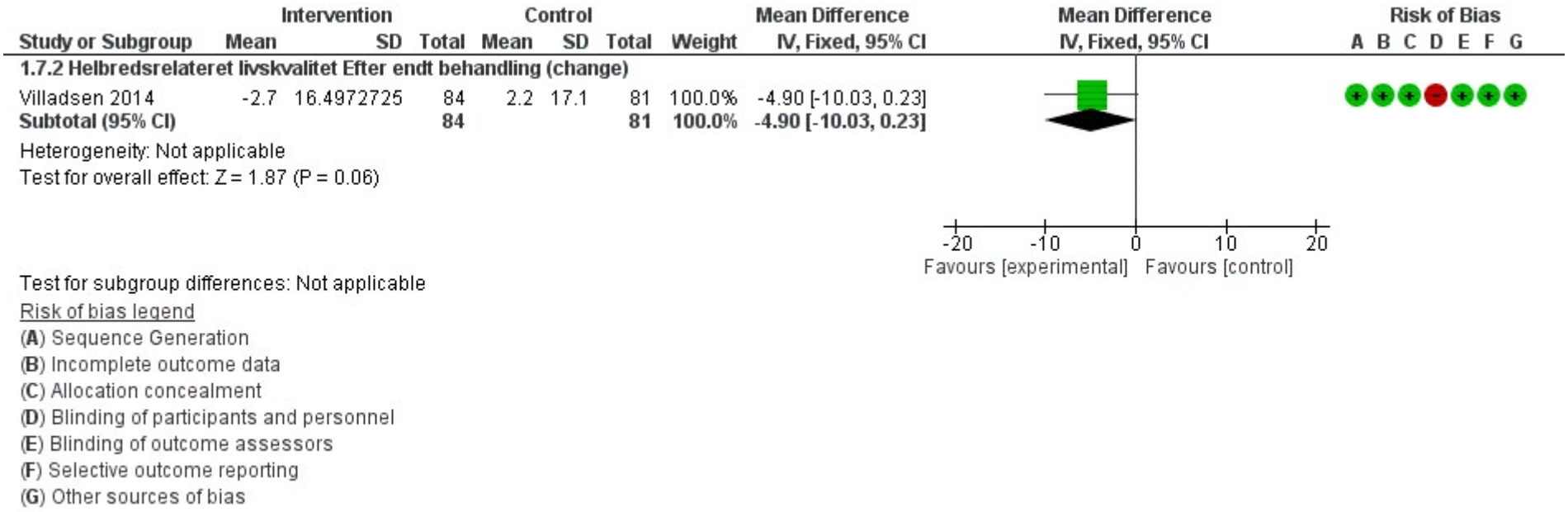
Forest plot of comparison: 1 Intervention vs Control, outcome: 1.4 Smerte (hofte) final score.

Figure 5 (Analysis 1.6)



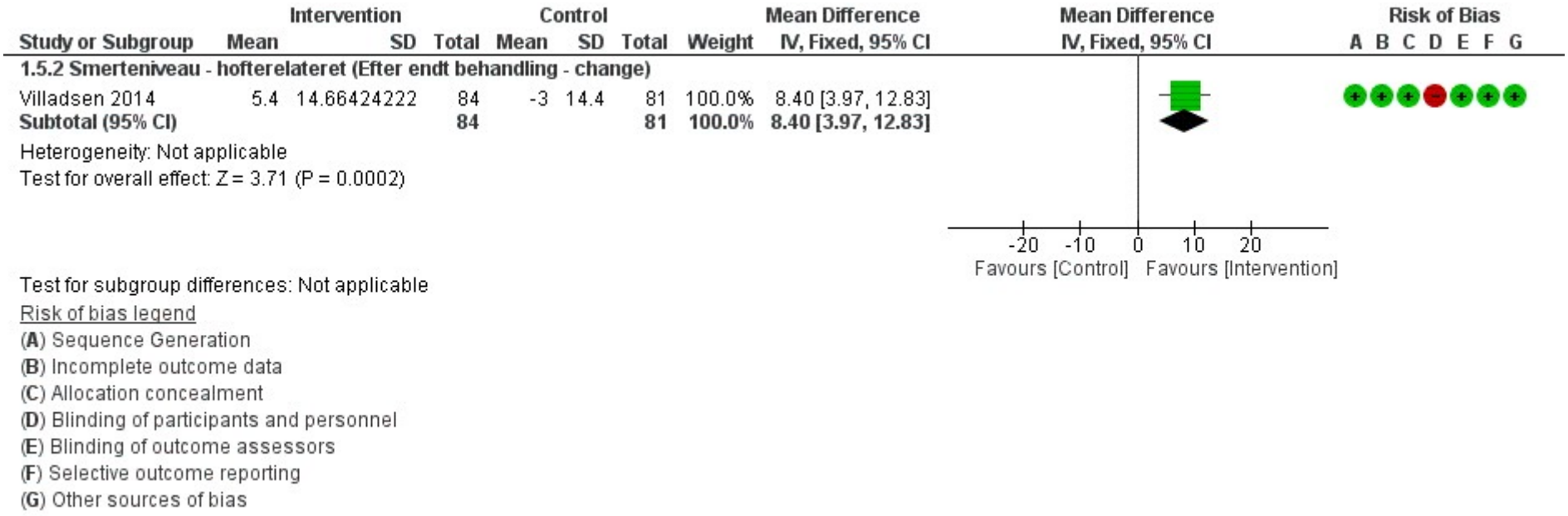
Forest plot of comparison: 1 Intervention vs Control, outcome: 1.6 Helbredsrelateret livskvalitet (final score).

Figure 6 (Analysis 1.7)



Forest plot of comparison: 1 Intervention vs Control, outcome: 1.7 Helbredsrelateret livskvalitet - change.

Figure 7 (Analysis 1.5)



Forest plot of comparison: 1 Intervention vs Control, outcome: 1.5 Smerte (hofte) change.