

## NKR 47: PICO 8, Kombineret fysisk træning med eller uden ernæringsindsats til geriatrike patienter med funktionsevnedssættelse og med underernæring eller risiko herfor.

### Review information

#### Authors

Sundhedsstyrelsen<sup>1</sup>

<sup>1</sup>[Empty affiliation]

Citation example: S. NKR 47: PICO 8, Kombineret fysisk træning med eller uden ernæringsindsats til geriatrike patienter med funktionsevnedssættelse og med underernæring eller risiko herfor.. Cochrane Database of Systematic Reviews [Year], Issue [Issue].

#### What's new

Date / Event	Description
--------------	-------------

### Characteristics of studies

#### Characteristics of included studies

##### Rydwik 2008

<b>Methods</b>	<p><b>Study design:</b> Randomized controlled trial</p> <p><b>Study grouping:</b> Parallel group</p> <p><b>Open Label:</b></p> <p><b>Cluster RCT:</b></p>
<b>Participants</b>	<p><b>Baseline Characteristics</b></p> <p>Intervention Group</p> <ul style="list-style-type: none"> <li>● Age (Mean, SD): 82.6, 4</li> <li>● Sex (% Male): 36</li> <li>● Comorbidity (Yes/No): Yes (on average 6 prescribed medications)</li> <li>● Undernourished or at risk (Yes/ No): Yes</li> <li>● Frail (Yes/No): Yes</li> <li>● Impairment (Body functions &amp; Structure descriptions): NR</li> <li>● Limitations (Activity Descriptions): Low level of physical activity</li> <li>● Restrictions (Participation descriptions): Personal ADL ( q1=81 q3=88) (max=91)</li> <li>● Housing (eg. residential homes, own house): Own House</li> </ul>

	<ul style="list-style-type: none"> <li>● <i>Civil status (%Living alone)</i>: 16</li> <li>● <i>In risk of falling (Yes/No)</i>: NR</li> </ul> <p>Control Group</p> <ul style="list-style-type: none"> <li>● <i>Age (Mean, SD)</i>: 83</li> <li>● <i>Sex (% Male)</i>: 52</li> <li>● <i>Comorbidity (Yes/No)</i>: Yes (on average 6 prescribed medications)</li> <li>● <i>Undernourished or at risk (Yes/ No)</i>: Yes</li> <li>● <i>Frail (Yes/No)</i>: Yes</li> <li>● <i>Impairment (Body functions &amp; Structure descriptions)</i>: NR</li> <li>● <i>Limitations (Activity Descriptions)</i>: Low level of physical activity</li> <li>● <i>Restrictions (Participation descriptions)</i>: Personal ADL ( q1=83 q3=89) (max=91)</li> <li>● <i>Housing (eg. residential homes, own house)</i>: Own House</li> <li>● <i>Civil status (%Living alone)</i>: 8</li> <li>● <i>In risk of falling (Yes/No)</i>: NR</li> </ul> <p><b>Included criteria:</b> Included were elderly people, aged 75 and older, defined as frail using the definition by Chin A Paw, comprising both a nutritional and a physical focus: ● unintentional weight loss of <math>\geq 5\%</math> during the last year and/or body mass index (BMI) <math>&lt;20 \text{ kg/m}^2</math> ● low physical activity level (<math>\leq</math> grade 3 in the Mattiasson-Nilo classification of physical activity.)</p> <p><b>Excluded criteria:</b> Exclusion criteria were age under 75, BMI <math>&gt; 30 \text{ kg/m}^2</math>, non-walkers, recent cardiac problems requiring hospital care, hip fracture or surgery during the last six months, current cancer treatment, stroke within the last two years and less than 7 points of a total 9-point score on the short form of the Mini Mental State Examination (9), and institutionalised residents.</p> <p><b>Pretreatment:</b> More men in the control group</p>
<p><b>Interventions</b></p>	<p><b>Intervention Characteristics</b> Intervention Group</p> <ul style="list-style-type: none"> <li>● <i>Description</i>: Nutritional intervention in combination with training. The nutritional intervention consisted of individual dietary counselling based on the baseline food record data focusing on food choices and meal patterns. Energy needs of each individual were estimated as 1.5 x RMR. Suggestions that would cover the needs of each individual were presented and discussed at an individual session lasting about one hour. The nutritional intervention included five group sessions that covered such topics as nutritional needs for the elderly, meal frequency and cooking methods. the physical training consisted of 60-minute organised sessions twice a week for twelve weeks, with emphasis on endurance, muscle strength and balance. The program consisted of three corresponding sections: i) warm-up including aerobic training, ii) individually prescribed muscle strength training, and iii) Qigong including cool-down. The warm-up/aerobic training section consisted of standing exercises, such as walking/jogging on the spot, walking forwards/backwards and sideways, and arm movements. The muscle-strength training section consisted of two separate stations: high intensity strength training on stationary equipment and functional strength training with weight belts. The balance training section consisted of different Qigong exercises performed on different degrees of supporting area combined with arm and trunk movements. These exercises were progressed with increasing difficulty.</li> <li>● <i>Duration (Weeks)</i>: 12</li> <li>● <i>Dose (eg. sessions, ml, energy/protein target, RM and repetitions)</i>: Nutrition: 1 individual counselling + 5 groups sessions. Training: 2 x</li> </ul>

	<p>60 min /week</p> <ul style="list-style-type: none"> <li>● <i>Personel</i> (eg. dietician, nurse, physiotherapist): Nutrition: Dietician. Training: Planned by physiotherapist, led by trained instructor</li> </ul> <p>Control Group</p> <ul style="list-style-type: none"> <li>● <i>Description</i>: The physical training consisted of 60-minute organised sessions twice a week for twelve weeks, with emphasis on endurance, muscle strength and balance. The program consisted of three corresponding sections: i) warm-up including aerobic training, ii) individually prescribed muscle strength training, and iii) Qigong including cool-down. The warm-up/aerobic training section consisted of standing exercises, such as walking/jogging on the spot, walking forwards/backwards and sideways, and arm movements. The muscle-strength training section consisted of two separate stations: high intensity strength training on stationary equipment and functional strength training with weight belts. The balance training section consisted of different Qigong exercises performed on different degrees of supporting area combined with arm and trunk movements. These exercises were progressed with increasing difficulty.</li> <li>● <i>Duration (Weeks)</i>: 12</li> <li>● <i>Dose</i> (eg. sessions, ml, energy/protein target, RM and repetitions): 2x60min/week</li> <li>● <i>Personel</i> (eg. dietician, nurse, physiotherapist): Planned by physiotherapist, led by trained instructor</li> </ul>
<p><b>Outcomes</b></p>	<p><i>Kropsvægt (Bodyweight) EOT</i></p> <ul style="list-style-type: none"> <li>● <b>Outcome type</b>: ContinuousOutcome</li> <li>● <b>Scale</b>: Vægt</li> <li>● <b>Unit of measure</b>: kg</li> <li>● <b>Direction</b>: Higher is better</li> <li>● <b>Data value</b>: Change from baseline</li> </ul> <p><i>Kropsvægt (Body weight) LFU</i></p> <ul style="list-style-type: none"> <li>● <b>Outcome type</b>: ContinuousOutcome</li> <li>● <b>Reporting</b>: Fully reported</li> <li>● <b>Scale</b>: Vægt</li> <li>● <b>Unit of measure</b>: kg</li> <li>● <b>Direction</b>: Higher is better</li> <li>● <b>Data value</b>: Change from baseline</li> </ul> <p><i>Muskelstyrke (Muscle strength) EOT</i></p> <ul style="list-style-type: none"> <li>● <b>Outcome type</b>: ContinuousOutcome</li> <li>● <b>Reporting</b>: Fully reported</li> <li>● <b>Scale</b>: Leg Press Strength</li> <li>● <b>Unit of measure</b>: kg</li> <li>● <b>Direction</b>: Higher is better</li> <li>● <b>Data value</b>: Change from baseline</li> </ul> <p><i>Muskelstyrke (Muscle strength) LFU</i></p>

- **Outcome type:** ContinuousOutcome
- **Reporting:** Fully reported
- **Scale:** Leg Press Strength
- **Unit of measure:** kg
- **Direction:** Higher is better
- **Data value:** Change from baseline

#### *Mobilitet (Mobility) EOT*

- **Outcome type:** ContinuousOutcome
- **Reporting:** Fully reported
- **Scale:** Maximal walking speed
- **Unit of measure:** meter/second
- **Direction:** Higher is better
- **Data value:** Change from baseline

#### *Mobilitet (Mobility) LFU*

- **Outcome type:** ContinuousOutcome
- **Reporting:** Fully reported
- **Scale:** maximal walking speed
- **Unit of measure:** meter/second
- **Direction:** Higher is better
- **Data value:** Change from baseline

#### *Hverdagsaktiviteter (Activities of Daily living) EOT*

- **Outcome type:** ContinuousOutcome
- **Reporting:** Partially reported
- **Scale:** Functional Independence Measure
- **Range:** 0-91
- **Unit of measure:** Points
- **Direction:** Higher is better
- **Data value:** Endpoint
- **Notes:** Data er opgivet som median og Inter Quartile Range, har tastet det i skabelonen Mean (CI)

#### *Hverdagsaktiviteter (Activities of daily living) LFU*

- **Outcome type:** ContinuousOutcome
- **Reporting:** Partially reported
- **Scale:** Functional Independence Measure
- **Range:** 0-91
- **Unit of measure:** Points
- **Direction:** Higher is better

	<ul style="list-style-type: none"> <li>● <b>Data value:</b> Endpoint</li> <li>● <b>Notes:</b> Data er opgivet som median og Inter Quartile Range. Har tastet i skabelonen for Mean (CI)</li> </ul> <p><i>Livskvalitet (Quality of Life) EOT</i></p> <ul style="list-style-type: none"> <li>● <b>Outcome type:</b> ContinuousOutcome</li> <li>● <b>Reporting:</b> Not reported</li> </ul> <p><i>Livskvalitet (Quality of Life) LFU</i></p> <ul style="list-style-type: none"> <li>● <b>Outcome type:</b> ContinuousOutcome</li> <li>● <b>Reporting:</b> Not reported</li> </ul> <p><i>Livskvalitet, fysisk (Quality of Life, physical)</i></p> <ul style="list-style-type: none"> <li>● <b>Outcome type:</b> ContinuousOutcome</li> <li>● <b>Reporting:</b> Not reported</li> </ul> <p><i>Livskvalitet, mental (Quality of Life, mental)</i></p> <ul style="list-style-type: none"> <li>● <b>Outcome type:</b> ContinuousOutcome</li> <li>● <b>Reporting:</b> Not reported</li> </ul> <p><i>Kvalme (Nausea)</i></p> <ul style="list-style-type: none"> <li>● <b>Outcome type:</b> ContinuousOutcome</li> <li>● <b>Reporting:</b> Not reported</li> </ul> <p><i>Diarre (Diarrhea)</i></p> <ul style="list-style-type: none"> <li>● <b>Outcome type:</b> DichotomousOutcome</li> <li>● <b>Reporting:</b> Not reported</li> </ul> <p><i>Opkast (vomit)</i></p> <ul style="list-style-type: none"> <li>● <b>Outcome type:</b> DichotomousOutcome</li> <li>● <b>Reporting:</b> Not reported</li> </ul> <p><i>Flatulens (Flatulence)</i></p> <ul style="list-style-type: none"> <li>● <b>Outcome type:</b> DichotomousOutcome</li> <li>● <b>Reporting:</b> Not reported</li> </ul> <p><i>Fald (Falls) EOT</i></p> <ul style="list-style-type: none"> <li>● <b>Outcome type:</b> AdverseEvent</li> <li>● <b>Reporting:</b> Not reported</li> </ul>
<b>Identification</b>	<p><b>Sponsorship source:</b> The study was financed by Äldreforskning Nord Väst</p> <p><b>Country:</b> Sweden</p> <p><b>Setting:</b> The study was performed on an outpatient basis in an elderly research centre in Solna, a suburb of Stockholm, Sweden</p> <p><b>Comments:</b></p>

<b>Authors name:</b> Elisabeth Rydwick
<b>Institution:</b> Research and Development Unit for the Elderly, North, Jakobsbergs Hospital, Karolinska Institutet, Järfälla,
<b>Email:</b> elisabeth.rydwick@sl.se
<b>Address:</b> Research Unit for the Elderly, North, Jakobsbergs Hospital, Karolinska Institutet, Birgittavägen 4, 177 31 Järfälla, Sweden
<b>Notes</b> <i>Lillian Mørch Jørgensen on 20/04/2016 02:13</i>
<b>Outcomes</b> i tabellen er angivet vægtændringer i forhold til baseline. Skal jeg omregne til kg?

### Risk of bias table

Bias	Authors' judgement	Support for judgement
Other sources of bias	Unclear risk	Judgement Comment: A substantial part of the participants seems to have no risk of malnutrition... This not equivalent to our definition of the PICO population, and this might bias the effect of the intervention.
Sequence Generation	High risk	Judgement Comment: The subjects were randomised consecutively into four different groups. The randomisation procedure was conducted in an open manner by the study personnel with the instructions of a statistician. For each new group, randomisation started with the oldest individual to avoid age differences between groups.
Incomplete outcome data	High risk	Judgement Comment: 11 dropout of 25 in the intervention group4 dropout of 23 in the controlgroup
Selective outcome reporting	Unclear risk	Judgement Comment: However they seem to report all relevant outcomes
Allocation concealment	High risk	Judgement Comment: The subjects were randomised consecutively into four different groups. The randomisation procedure was conducted in an open manner by the study personnel with the instructions of a statistician. For each new group, randomisation started with the oldest individual to avoid age differences between groups.
Blinding of participants and personnel	High risk	Judgement Comment: "The study was completed without blinding"
Blinding of outcome assessors	High risk	Judgement Comment: The study was performed without blinding.

### Zak 2009

<b>Methods</b>	<b>Study design:</b> Randomized controlled trial <b>Study grouping:</b> Parallel group <b>Open Label:</b> <b>Cluster RCT:</b>
<b>Participants</b>	<b>Baseline Characteristics</b> Intervention Group <ul style="list-style-type: none"> <li>● Age (Mean, SD): 78.1, 7.6</li> <li>● Sex (% Male): 16</li> </ul>

	<ul style="list-style-type: none"> <li>● Comorbidity (Yes/No): Yes</li> <li>● Undernourished or at risk (Yes/ No): Yes (Baseline MNA (mean, sd: 22.1, 2.6)</li> <li>● Frail (Yes/No): NR</li> <li>● Impairment (Body functions &amp; Structure descriptions): NR</li> <li>● Limitations (Activity Descriptions): Baseline ADL (max=6) (mean,sd) =5.4, 0.8</li> <li>● Restrictions (Participation descriptions): NR</li> <li>● Housing (eg. residential homes, own house): Nursing Home og community dwelling</li> <li>● Civil status (%Living alone): NR</li> <li>● In risk of falling (Yes/No): Berg balance Scale (Mean,SD) = 45, 9.5</li> </ul> <p>Control Group</p> <ul style="list-style-type: none"> <li>● Age (Mean, SD): 79.2, 9.2</li> <li>● Sex (% Male): 19</li> <li>● Comorbidity (Yes/No): Yes</li> <li>● Undernourished or at risk (Yes/ No): Yes (Baseline MNA (mean, sd: 23.1, 2.5)</li> <li>● Frail (Yes/No): NR</li> <li>● Impairment (Body functions &amp; Structure descriptions): NR</li> <li>● Limitations (Activity Descriptions): Baseline ADL (Max=6) (Mean, sd) =5.5, 0.8</li> <li>● Restrictions (Participation descriptions): NR</li> <li>● Housing (eg. residential homes, own house): Nursing home or community dwelling</li> <li>● Civil status (%Living alone): NR</li> <li>● In risk of falling (Yes/No): Bergs balance Scale (Mean, SD) = 47, 8.2</li> </ul> <p><b>Included criteria:</b> Age ranging 60 – 95 years. Body weight (being overweight within a 20% range). Body Mass Index (BMI) &gt; 19. Individual balance, as evidenced by &gt; 21 score on the Berg Balance Scale (BBS). Score of &gt; 20 on the Mini Mental State Examination(MMSE). Lack of any counter-indications on medical grounds (i.e. no currently administered medication interfering with individual balance and overall movement coordination)</p> <p><b>Excluded criteria:</b> 1. Cancerous disease in the stage of advancement rendering a subject's participation in the trial non-feasible2. Prior surgical treatment of the abdominal area within three months prior to the commencement of the study3. Acute gastric tract disorders4. Acute pancreatitis or diabetes5. Any recently sustained fractures (i.e. within the year immediately preceding the commencement of the study)6. Any past cerebral incidents whose lasting functional after-effects would make the pursuit of exercise regimens non-feasible (e.g. hemiplegia accounting for a stiff kneejoint)</p> <p><b>Pretreatment:</b></p>
<p><b>Interventions</b></p>	<p><b>Intervention Characteristics</b></p> <p>Intervention Group</p> <ul style="list-style-type: none"> <li>● Description: Kombineret træning (Functionally Oriented exercises and Progressive strength training) og Oral Nutritional Supplements</li> <li>● Duration (Weeks): 7</li> <li>● Dose (eg. sessions, ml, energy/protein target, RM and repetitions): Progressive Strength Training: 80% of 1-RM. Kombineret træning 5 days/week ONS: 200ml, 300 kcal, 12 g protein (5 a week)</li> </ul>

	<ul style="list-style-type: none"> <li>● <i>Personel</i> (eg. <i>dietician, nurse, physiotherapist</i>): Nursing staff and Physiotherapist</li> </ul> <p>Control Group</p> <ul style="list-style-type: none"> <li>● <i>Description</i>: Kombineret træning (Functionally Oriented exercises and Progressive strength training) og Placebo Oral Nutritional Supplement</li> <li>● <i>Duration</i> (Weeks): 7</li> <li>● <i>Dose</i> (eg. <i>sessions, ml, energy/protein target, RM and repetitions</i>): Progressive Strength Training: 80% of 1-RM. Kombineret træning 5 days/week ONS: 200ml, 41 kcal (5 a week)</li> <li>● <i>Personel</i> (eg. <i>dietician, nurse, physiotherapist</i>): Nursing staff and physiotherapist</li> </ul>
<p><b>Outcomes</b></p>	<p><i>Kropsvægt (Bodyweight) EOT</i></p> <ul style="list-style-type: none"> <li>● <b>Outcome type</b>: ContinuousOutcome</li> <li>● <b>Reporting</b>: Not reported</li> </ul> <p><i>Kropsvægt (Body weight) LFU</i></p> <ul style="list-style-type: none"> <li>● <b>Outcome type</b>: ContinuousOutcome</li> </ul> <p><i>Muskelstyrke (Muscle strength) EOT</i></p> <ul style="list-style-type: none"> <li>● <b>Outcome type</b>: ContinuousOutcome</li> <li>● <b>Reporting</b>: Fully reported</li> <li>● <b>Scale</b>: Knee extension</li> <li>● <b>Unit of measure</b>: Newton/meter</li> <li>● <b>Direction</b>: Higher is better</li> <li>● <b>Data value</b>: Endpoint</li> </ul> <p><i>Muskelstyrke (Muscle strength) LFU</i></p> <ul style="list-style-type: none"> <li>● <b>Outcome type</b>: ContinuousOutcome</li> <li>● <b>Reporting</b>: Not reported</li> </ul> <p><i>Mobilitet (Mobility) EOT</i></p> <ul style="list-style-type: none"> <li>● <b>Outcome type</b>: ContinuousOutcome</li> <li>● <b>Reporting</b>: Fully reported</li> <li>● <b>Scale</b>: 6 minute walking Test</li> <li>● <b>Unit of measure</b>: Meter</li> <li>● <b>Direction</b>: Higher is better</li> <li>● <b>Data value</b>: Endpoint</li> </ul> <p><i>Mobilitet (Mobility) LFU</i></p> <ul style="list-style-type: none"> <li>● <b>Outcome type</b>: ContinuousOutcome</li> <li>● <b>Reporting</b>: Not reported</li> </ul> <p><i>Hverdagsaktiviteter (Activities of Daily living) EOT</i></p>



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

*Hverdagsaktiviteter (Activities of daily living) LFU*

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

*Livskvalitet (Quality of Life) EOT*

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

*Livskvalitet (Quality of Life) LFU*

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

*Livskvalitet, fysisk (Quality of Life, physical)*

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

*Livskvalitet, mental (Quality of Life, mental)*

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

*Kvalme (Nausea)*

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

*Diarre (Diarrhea)*

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

*Opkast (vomit)*

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

*Flatulens (Flatulence)*

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

*Fald (Falls) EOT*

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

<b>Identification</b>	<p><b>Sponsorship source:</b> The trial was funded by NUTRICIA RESEARCH FOUNDATION (Grant Ref. No CEBK180/2000).</p> <p><b>Country:</b> Poland</p> <p><b>Setting:</b> Nursing home facility, as well as former patients of the University Clinic Geriatric Ward</p> <p><b>Comments:</b> The founders had no role in the actual study design; in the collection, analysis and in the interpretation of data; in the drafting of the manuscript; and in the decision to submit the manuscript for publication</p> <p><b>Authors name:</b> Marek Zak</p> <p><b>Institution:</b> Chair of Clinical Rehabilitation, University School of Physical Education, Krakow, Poland,</p> <p><b>Email:</b> mzak1@onet.eu</p> <p><b>Address:</b> University School of Physical Education, Krakow, Poland,</p>
<b>Notes</b>	<p>Nkr 47 Geria on 12/04/2016 23:10</p> <p><b>Select</b>                      Populationen er lige på grænsen til vores. De er gennemsnitligt i risiko for underernæring (MNA&lt;24), men det fremgår ikke tydeligt om de er frail.</p> <p>Dennis Bramsen on 14/04/2016 01:21</p> <p><b>Select</b>                      jeg kan ikke se at deres inklusionskriterier er specifikke nok.</p>

Risk of bias table

Bias	Authors' judgement	Support for judgement
Other sources of bias	Low risk	
Sequence Generation	Low risk	Judgement Comment: Participants were randomly assigned (through computerassistedrandomisation) to either the control, or interventiongroup after the baseline testing.
Incomplete outcome data	Low risk	Judgement Comment: overall 10 participants dropped out before commencement of the trail.
Selective outcome reporting	Low risk	Judgement Comment: Trial registration: Central Register of Clinical Trials, Poland – CEBK180/2000.
Allocation concealment	Unclear risk	Quote: "Allocation of study subjects into the respective groups envisaged equal distribution of both the nursing home residents and former geriatric ward patients. The assessors were duly blinded to the group allocations in respect of all outcome measures."
Blinding of participants and personnel	Low risk	Judgement Comment: Double-blinding with regard to nutritional supplementationwas assured.Withrespect to the exercise regimen, each set of exercises wassupervised by a separate group of outsourced, free-lancephysiotherapists who had no knowledge of the actualnature of the complementary set of exercises, nor did theycome into personal contact with each other in any of thesettings, so no inferences could possibly have been madeby them as to the true purpose of the two combined regimens.

Blinding of outcome assessors

Low risk

Judgement Comment: The assessors were duly blinded to the group allocations in respect of all outcome measures.

*Footnotes***References to studies****Included studies****Rydwik 2008**

Lammes,E.; Rydwik,E.; Akner,G.. Effects of nutritional intervention and physical training on energy intake, resting metabolic rate and body composition in frail elderly. a randomised, controlled pilot study. *The journal of nutrition, health & aging* 2012;16(2):162-7. [DOI: ]

Rydwik,Elisabeth; Frandin,Kerstin; Akner,Gunnar. Effects of a physical training and nutritional intervention program in frail elderly people regarding habitual physical activity level and activities of daily living--a randomized controlled pilot study. *Archives of Gerontology and Geriatrics* 2010;51(3):283-9. [DOI: ]

Rydwik,Elisabeth; Lammes,Eva; Frandin,Kerstin; Akner,Gunnar. Effects of a physical and nutritional intervention program for frail elderly people over age 75. A randomized controlled pilot treatment trial. *Aging clinical and experimental research* 2008;20(2):159-70. [DOI: ]

**Zak 2009**

Zak,Marek; Swine,Christian; Grodzicki,Tomasz. Combined effects of functionally-oriented exercise regimens and nutritional supplementation on both the institutionalised and free-living frail elderly (double-blind, randomised clinical trial). *BMC public health* 2009;9(Journal Article):39. [DOI: ]

**Excluded studies****Abizanda 2015**

Abizanda P.; Lopez M.D.; Garcia V.P.; Estrella J.D.D.; da Silva,Gonzalez A.; Vilardell N.B.; Torres K.A.. Effects of an oral nutritional supplementation plus physical exercise intervention on the physical function, nutritional status, and quality of life in frail institutionalized older adults: The ACTIVNES study. *Journal of the American Medical Directors Association* 2015;16(5):439. [DOI: ]

**Alves 2013**

Alves,Christiano Robles Rodrigues; Meree Filho,Carlos,Alberto Abujabra; Benatti,Fabiana Braga; Brucki,Sonia; Pereira,Rosa Maria R.; Pinto,de Sa; Lima,Fernanda Rodrigues; Roschel,Hamilton; Gualano,Bruno. Creatine supplementation associated or not with strength training upon emotional and cognitive measures in older women: a randomized double-blind study. *PloS one* 2013;8(10):e76301. [DOI: ]

**Baer 2013**

Baer,Janine T.. Improving protein and vitamin D status of obese patients participating in physical rehabilitation. *Rehabilitation nursing : the official journal of the Association of Rehabilitation Nurses* 2013;38(3):115-9. [DOI: ]

### **Beck 2015**

Beck,A.; Andersen, U. T.; Leedo,E.; Jensen,L. L.; Martins,K.; Quvang,M.; Rask,K. O.; Vedelspang,A.; Ronholt,F.. Does adding a dietician to the liaison team after discharge of geriatric patients improve nutritional outcome: a randomised controlled trial. *Clinical rehabilitation* 2015;29(11):1117-28. [DOI: ]

### **Bonnefooy 2012**

Bonnefooy M.; Boutitte F.; Mercier C.; Gueyffier F.; Carre C.; Guetemme G.; Ravis B.; Laville M.; Cornu C.. Efficacy of a home-based intervention programme on the physical activity level and functional ability of older people using domestic services: A randomised study. *Journal of Nutrition, Health and Aging* 2012;16(4):370-377. [DOI: ]

### **Chan 2012**

Chan,Ding-Cheng Derrick; Tsou,Hsiao-Hui; Yang,Rong-Sen; Tsauo,Jau-Yih; Chen,Ching-Yu; Hsiung,Chao Agnes; Kuo,Ken N.. A pilot randomized controlled trial to improve geriatric frailty. *BMC geriatrics* 2012;12(Journal Article):58. [DOI: ]

### **Dapp 2014**

Dapp U.; Anders J.A.M.; Suijker J.J.M.; Bjorkman M.P.. Various aspects of interventions on physical functioning in community dwelling older persons. *European Geriatric Medicine* 2014;5(Web Page):S26-S27. [DOI: ]

### **Fairhall 2008**

Fairhall,Nicola; Aggar,Christina; Kurrle,Susan E.; Sherrington,Catherine; Lord,Stephen; Lockwood,Keri; Monaghan,Noeline; Cameron,Ian D.. Frailty Intervention Trial (FIT). *BMC geriatrics* 2008;8(Journal Article):27. [DOI: ]

### **Fielding 2015**

Fielding R.; Kim D.; Koochek A.; Reid K.; Von,Berens A.; Trivison T.; Zhu H.; Foltz S.; Sacheck J.; Nelson M.; Liu C.; Phillips E.; Aberg A.C.; Nydahl M.; Gustafsson T.; Cederholm T.. Effect of nutritional supplementation and structured physical activity on walk capacity in mobility-limited older adults: Results from the VIVE2 study. *European Geriatric Medicine* 2015;6(Web Page):S178-S179. [DOI: ]

### **Gualano 2014**

Gualano,Bruno; Macedo,Andre Regis; Alves,Christiano Robles Rodrigues; Roschel,Hamilton; Benatti,Fabiana Braga; Takayama,Liliam; Pinto,de Sa; Lima,Fernanda Rodrigues; Pereira,Rosa Maria Rodrigues. Creatine supplementation and resistance training in vulnerable older women: a randomized double-blind placebo-controlled clinical trial. *Experimental gerontology* 2014;53(Journal Article):7-15. [DOI: ]

### **Kim 2012**

Kim,Hun Kyung; Suzuki,Takao; Saito,Kyoko; Yoshida,Hideyo; Kobayashi,Hisamine; Kato,Hiroyuki; Katayama,Miwa. Effects of exercise and amino acid supplementation on body composition and physical function in community-dwelling elderly Japanese sarcopenic women: a randomized controlled trial. *Journal of the American Geriatrics Society* 2012;60(1):16-23. [DOI: ]

**Kim 2012a**

Kim H.. Interventions for frailty and sarcopenia in community-dwelling elderly women. *Japanese Journal of Geriatrics* 2012;49(6):726-730. [DOI: ]

**Kirn 2014**

Kirn D.R.; Koochek A.; Reid K.F.; Von,Berens A.; Trivison T.; Folta S.; Sacheck J.; Nelson M.; Liu C.K.; Phillips E.; Aberg A.; Nydahl M.; Gustafsson T.; Cederholm T.; Fielding R.A.. The Vitality, Independence, and Vigor in the Elderly 2 Study (VIVE2): Design and methods. *European Geriatric Medicine* 2014;5(Web Page):S202. [DOI: ]

**Kivipelto 2014**

Kivipelto M.; Ngandu T.; Lehtisalo J.; Hanninen T.; Jula A.; Laatikainen T.; Lindstrom J.; Pajala S.; Peltonen M.; Stigsdotter-Neely A.; Levalahti E.; Strandberg T.E.; Tuomilehto J.; Soininen H.. A multidomain two-year randomized controlled trial to prevent cognitive impairment - The FINGER study. *European Geriatric Medicine* 2014;5(Web Page):S69. [DOI: ]

**Kivipelto 2014a**

Kivipelto M.; Ngandu T.; Solomon A.; Rauramaa R.; Laatikainen T.; Strandberg T.; Tuomilehto J.; Lindstrom J.; Soininen H.. Multi-domain intervention studies to prevent dementia and AD. *Neurobiology of aging* 2014;35(Web Page):S12. [DOI: ]

**Komulainen 2010**

Komulainen P.; Kivipelto M.; Lakka T.A.; Savonen K.; Hassinen M.; Kiviniemi V.; Hanninen T.; Rauramaa R.. Exercise, fitness and cognition - A randomised controlled trial in older individuals: The DR's EXTRA study. *European Geriatric Medicine* 2010;1(5):266-272. [DOI: ]

**Kwon 2015**

Kwon,Jinhee; Yoshida,Yuko; Yoshida,Hideyo; Kim,Hunkyung; Suzuki,Takao; Lee,Yunhwan. Effects of a combined physical training and nutrition intervention on physical performance and health-related quality of life in prefrail older women living in the community: a randomized controlled trial. *Journal of the American Medical Directors Association* 2015;16(3):263.e1-8. [DOI: ]

**Ng 2014**

Ng T.P.; Lim L.M.; Niti M.; Nyunt M.S.Z.; Feng L.; Gwee X.; Ling A.; Tan B.Y.; Chan G.; Khoo S.M.C.; Ann S.; Yap P.; Yap K.B.. Effects of nutritional, physical, cognitive interventions on cognitive outcomes in the Singapore frailty intervention trial (S-FIT). *Annals of the Academy of Medicine Singapore* 2014;43(10):S68-S69. [DOI: ]

**Ng 2015**

Ng,Tze Pin; Feng,Liang; Nyunt,Ma Shwe Zin; Feng,Lei; Niti,Mathew; Tan,Boon Yeow; Chan,Gribson; Khoo,Sue Mei; Yap,Philip; Yap,Keng Bee. Nutritional, Physical, Cognitive, and Combination Interventions and Frailty Reversal Among Older Adults: A Randomized Controlled Trial. *The American Journal of Medicine* 2015;128(11):1225-1236.e1. [DOI: ]

**Nyunt 2014**

Nyunt M.S.Z.; Niti M.; Feng L.; Tan B.Y.; Chan G.; Chan S.M.; Ann K.S.; Yap P.; Yap K.B.; Ng T.P.. Singapore frailty intervention trial: Effect of frailty reversal on reducing depressive symptoms. *Annals of the Academy of Medicine Singapore* 2014;43(10):S29-S30. [DOI: ]

**Rosendahl 2006**

Rosendahl,Erik; Lindelof,Nina; Littbrand,Hakan; Yifter-Lindgren,Elinor; Lundin-Olsson,Lillemor; Haglin,Lena; Gustafson,Yngve; Nyberg,Lars. High-intensity functional exercise program and protein-enriched energy supplement for older persons dependent in activities of daily living: a randomised controlled trial. *The Australian journal of physiotherapy* 2006;52(2):105-13. [DOI: ]

**Rydwik 2010**

Rydwik,Elisabeth; Gustafsson,Thomas; Frandin,Kerstin; Akner,Gunnar. Effects of physical training on aerobic capacity in frail elderly people (75+ years). Influence of lung capacity, cardiovascular disease and medical drug treatment: a randomized controlled pilot trial. *Aging clinical and experimental research* 2010;22(1):85-94. [DOI: ]

**Solomon 2012**

Solomon A.; Ngandu T.; Ahiluoto S.; Julia A.; Laatikainen T.; Rauramaa R.; Strandberg T.; Tuomilehto J.; Soininen H.; Kivipelto M.. Results and experiences from scandinavianmulti-domain intervention trials (dts extra and finger). *Alzheimer's and Dementia* 2012;8(4):P605-P606. [DOI: ]

**Solomon 2014**

Solomon A.; Levalahti E.; Soininen H.; Tuomilehto J.; Lindstrom J.; Lehtisalo J.; Peltonen M.; Kivipelto M.; Antikainen R.; Paajanen T.; Ngandu T.; Laatikainen T.; Strandberg T.; Hanninen T.. A multidomain, two-year, randomized controlled trial to prevent cognitive impairment: The finger study. *Alzheimer's and Dementia* 2014;10(Web Page):P137-P138. [DOI: ]

**Strandberg 2015**

Strandberg T.; Ngandu T.; Antikainen R.; Laatikainen T.; Lindstrom J.; Pajala S.; Tuomilehto J.; Soininen H.; Kivipelto M.. Health-related quality of life in a multidomain intervention trial to prevent cognitive decline (the FINGER Study). *European Geriatric Medicine* 2015;6(Web Page):S21. [DOI: ]

**Takai 2013**

Takai I.. Influence of comprehensive intervention composed of nutrition and exercise on the development of exercise habits and self-perceived health among community-dwelling elderly individuals. *Japanese Journal of Geriatrics* 2013;50(4):522-527. [DOI: ]

**Tieland 2012**

Tieland,Michael; Dirks,Marlou L.; van,der Zwaluw; Verdijk,Lex B.; van,de Rest; de Groot,Lisette,C.P.G.M.; van Loon,Luc,J.C.. Protein supplementation increases muscle mass gain during prolonged resistance-type exercise training in frail elderly people: a randomized, double-blind, placebo-controlled trial. *Journal of the American Medical Directors Association* 2012;13(8):713-9. [DOI: ]

**Trabal 2015**

Trabal J.; Forga M.; Leyes P.; Torres F.; Rubio J.; Prieto E.; Farran-Codina A.. Effects of free leucine supplementation and resistance training on muscle strength and functional status in older adults: A randomized controlled trial. *Clinical Interventions in Aging* 2015;10(Web Page):713-723. [DOI: ]

**van 2014**

van,de Rest; van der Zwaluw,Nikita,L.; Tieland,Michael; Adam,Jos J.; Hiddink,Gert Jan; van Loon,Luc,J.C.; de Groot,Lisette,C.P.G.M.. Effect of resistance-type exercise training with or without protein supplementation on cognitive functioning in frail and pre-frail elderly: secondary analysis of a randomized, double-blind, placebo-controlled trial. *Mechanisms of ageing and development* 2014;136-137(Journal Article):85-93. [DOI: ]

**vande 2013**

van de,Rest O.; van der,Zwaluw N.; Tieland M.; Adam J.J.; Hiddink G.J.; van,Loon L.; de,Groot L.. Effect of resistance-type exercise training with or without protein supplementation on cognitive functioning in frail and pre-frail elderly: Secondary analysis of a randomized, double-blind, placebo-controlled trial. Mechanisms of ageing and development 2013;136(Web Page):85-93. [DOI: ]

**Yoshimura 2013**

Yoshimura Y.; Uchida K.; Miyahara T.; Onishi T.; Okabe M.; Tateyama Y.. Impact of BCAA enriched nutritional support on rehabilitation in hospitalized frail elderly patients: A randomized controlled trial. Clinical Nutrition 2013;32(Web Page):S137. [DOI: ]

**Data and analyses**

**1 Kombineret træning/ernæring vs Træning**

Outcome or Subgroup	Studies	Participants	Statistical Method	Effect Estimate
1.1 Kropsvægt (Bodyweight) EOT	1	38	Mean Difference (IV, Fixed, 95% CI)	-0.20 [-1.30, 0.90]
1.1.1 At 12 weeks, kg	1	38	Mean Difference (IV, Fixed, 95% CI)	-0.20 [-1.30, 0.90]
1.2 Kropsvægt (Body weight) LFU	1	33	Mean Difference (IV, Fixed, 95% CI)	0.90 [-1.36, 3.16]
1.2.1 At 26 weeks, kg	1	33	Mean Difference (IV, Fixed, 95% CI)	0.90 [-1.36, 3.16]
1.3 Muskelstyrke (Muscle strength) EOT	2	78	Std. Mean Difference (IV, Random, 95% CI)	0.15 [-0.30, 0.59]
1.3.1 At 7-12 weeks	2	78	Std. Mean Difference (IV, Random, 95% CI)	0.15 [-0.30, 0.59]
1.4 Muskelstyrke (Muscle strength) LFU	1	33	Mean Difference (IV, Fixed, 95% CI)	0.90 [-9.77, 11.57]
1.4.1 Leg press (kg) at 26 weeks	1	33	Mean Difference (IV, Fixed, 95% CI)	0.90 [-9.77, 11.57]
1.5 Mobilitet (Mobility) EOT	2	78	Std. Mean Difference (IV, Random, 95% CI)	-0.14 [-0.92, 0.64]
1.5.1 At 7-12 weeks	2	78	Std. Mean Difference (IV, Random, 95% CI)	-0.14 [-0.92, 0.64]
1.6 Mobilitet (Mobility) LFU	1	33	Mean Difference (IV, Fixed, 95% CI)	0.09 [-0.13, 0.31]
1.6.1 Maximal walking speed (m/s), at 26 weeks	1	33	Mean Difference (IV, Fixed, 95% CI)	0.09 [-0.13, 0.31]
1.7 Hverdagsaktiviteter (Activities of Daily living) EOT	1	38	Mean Difference (IV, Fixed, 95% CI)	1.00 [-2.54, 4.54]
1.7.1 Functional Independence Measure (0-91), at 12 weeks	1	38	Mean Difference (IV, Fixed, 95% CI)	1.00 [-2.54, 4.54]

1.8 Hverdagsaktiviteter (Activities of daily living) LFU	1	30	Mean Difference (IV, Fixed, 95% CI)	-2.00 [-8.52, 4.52]
1.8.1 Functional Independence Measure (0-91) at 26 weeks	1	30	Mean Difference (IV, Fixed, 95% CI)	-2.00 [-8.52, 4.52]
1.9 Livskvalitet (Quality of Life) EOT	0	0	Mean Difference (IV, Fixed, 95% CI)	Not estimable
1.10 Livskvalitet (Quality of Life) LFU	0	0	Mean Difference (IV, Fixed, 95% CI)	Not estimable
1.11 Livskvalitet, fysisk (Quality of Life, physical)	0	0	Mean Difference (IV, Fixed, 95% CI)	Not estimable
1.12 Livskvalitet, mental (Quality of Life, mental)	0	0	Mean Difference (IV, Fixed, 95% CI)	Not estimable
1.13 Kvalme (Nausea)	0	0	Mean Difference (IV, Fixed, 95% CI)	Not estimable
1.14 Diarree (Diarrhea)	0	0	Risk Ratio (IV, Fixed, 95% CI)	No totals
1.15 Opkast (vomit)	0	0	Risk Ratio (IV, Fixed, 95% CI)	No totals
1.16 Flatulens (Flatulence)	0	0	Risk Ratio (IV, Fixed, 95% CI)	No totals

## Figures

Figure 1 (Analysis 1.1)

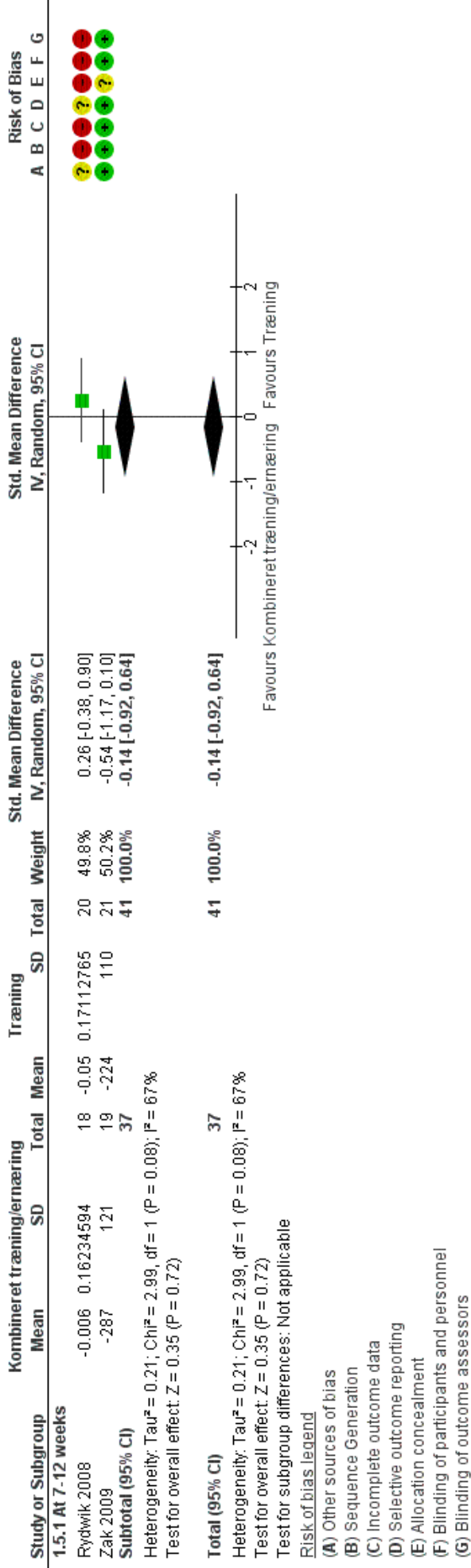






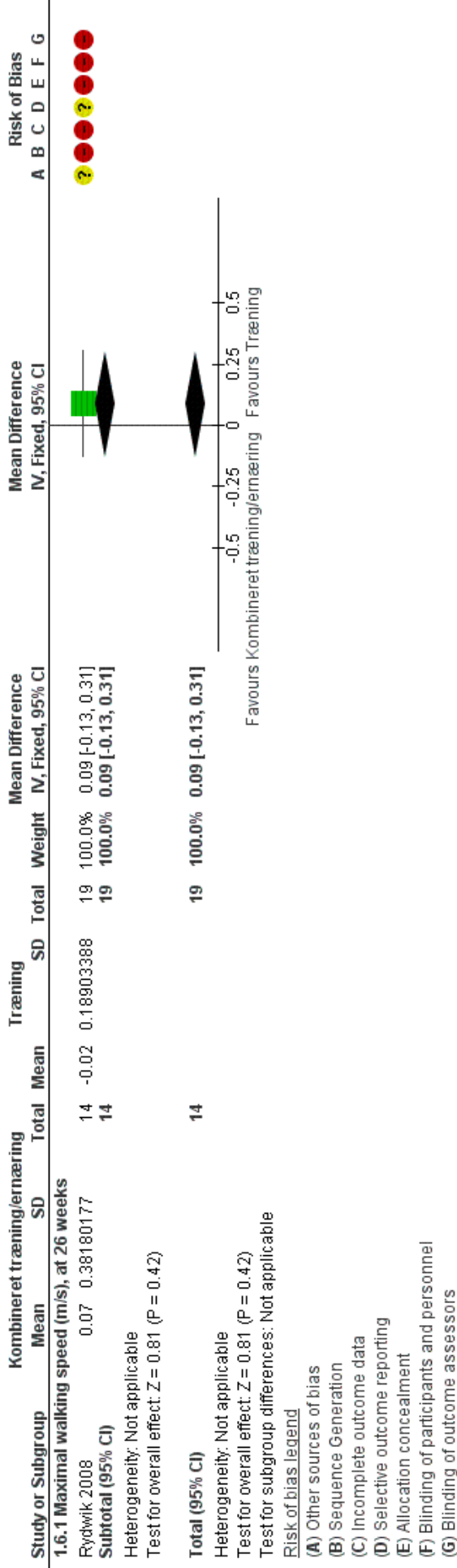






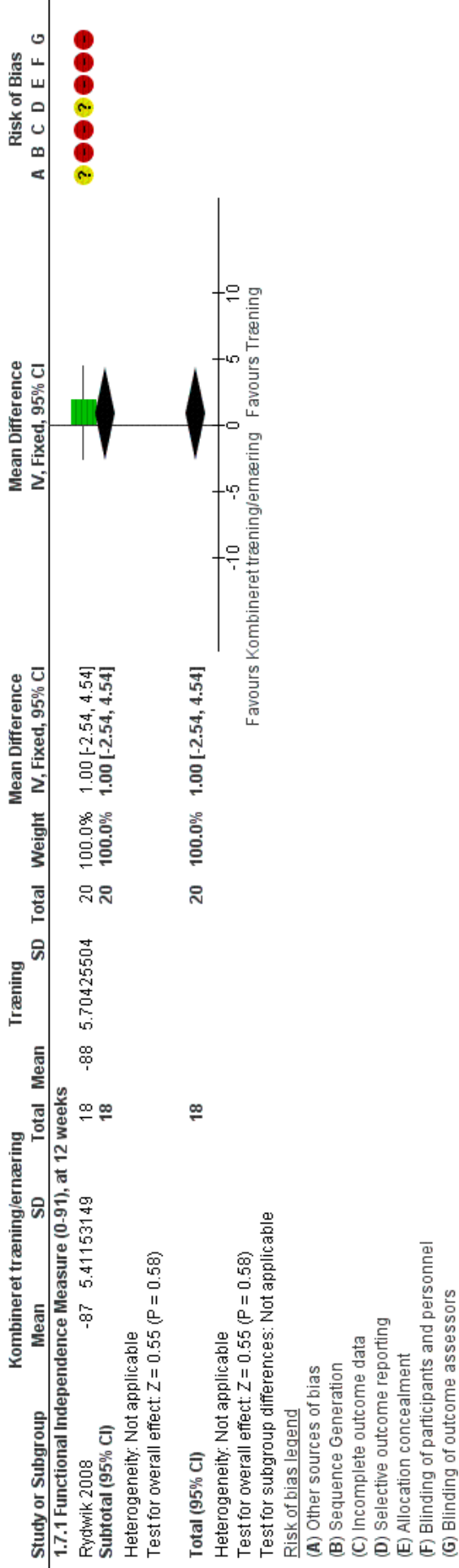
Forest plot of comparison: 1 Kombineret træning/ernæring vs Træning, outcome: 1.5 Mobilitet (Mobility) EOT.

Figure 6 (Analysis 1.6)



Forest plot of comparison: 1 Kombineret træning/ernæring vs Træning, outcome: 1.6 Mobilitet (Mobility) LFU.

Figure 7 (Analysis 1.7)



Forest plot of comparison: 1 Kombineret træning/ernæring vs Træning, outcome: 1.7 Hverdagsaktiviteter (Activities of Daily living) EOT.

Figure 8 (Analysis 1.8)

