

Exercise Interventions for fall prevention –

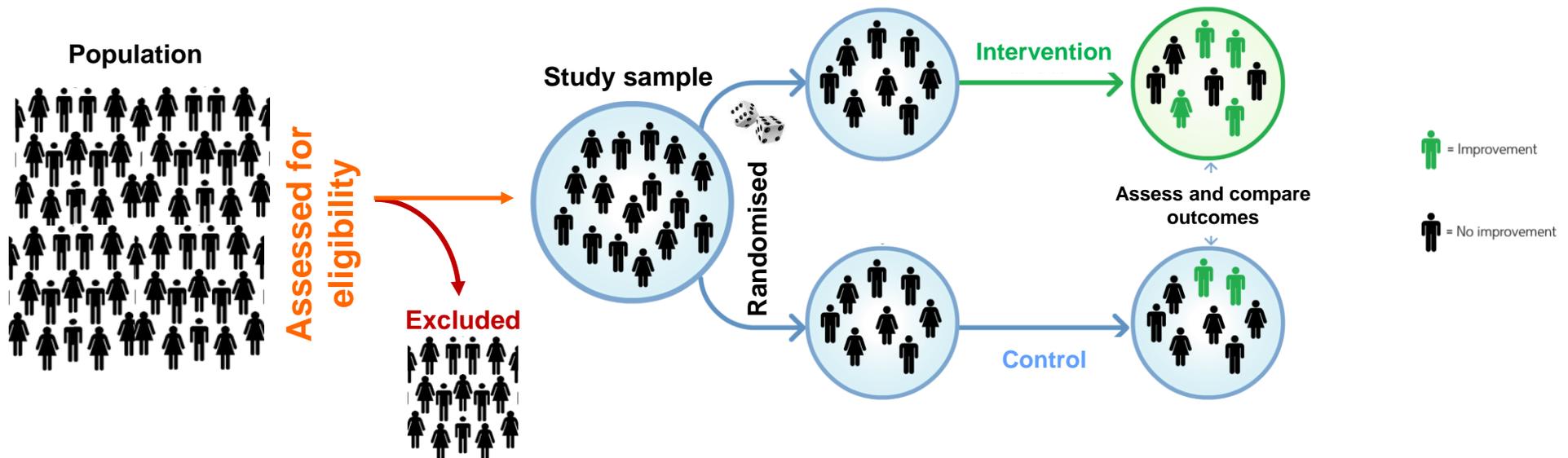
Dr Daina Sturnieks
NeuRA

Dr Jennie Hewitt
University Centre for Rural Health

Intervention evidence

Randomised Controlled Trial (RCT)

- the gold standard level of proof for treatments /therapies/interventions
- as many sources of bias as possible are removed from the process
 - random allocation of participants
 - control group



Interventions for preventing falls in community-dwellers

Interventions for preventing falls

Exercise

- Home-based, Group based

Vision

- Cataract surgery, spectacles

Medication use

- CNS Meds

Home modification programs

- Assessment and advice

Multiple component interventions

- Multiple yet same component interventions are provided to all people

Multifactorial interventions

- component interventions differ based on individual assessment of risk

Cochrane Review: Multi-interventions



Multifactorial and multiple component interventions for preventing falls in older people living in the community

Cochrane Systematic Review - Intervention | Version published: 23 July 2018

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✉ [Sally Hopewell](#) | [Olubusola Adedire](#) | [Bethan J Copsey](#) | [Graham J Boniface](#) | [Catherine Sherrington](#) | [Lindy Clemson](#)
| [Jacqueline CT Close](#) | [Sarah E Lamb](#)

- Multifactorial intervention (2+ components) based on individuals risk assessment (43 trials).
- Multiple component intervention - same combination of 2+ interventions given to all (18 trials).
- 62 trials, 19,935 older people.
- **Multifactorial interventions** (commonly exercise, environment or assistive technologies, medication review, psychological interventions)
 - May reduce the rate of falls by 23%, little/no effect on other fall outcomes.
 - May reduce risk of fall-related fractures by 27%.
 - May have small improvement on health-related quality of life
- **Multiple component interventions** (commonly exercise + education or home-hazard assessment)
 - Reduce the rate of falls by 26%
 - Reduce the risk of falls by 18%.
 - May improve health-related quality of life.

Cochrane Review: Exercise Interventions



Exercise for preventing falls in older people living in the community

Cochrane Systematic Review - Intervention | Version published: 31 January 2019



[View article information](#)

✉ Catherine Sherrington | Nicola J Fairhall | Geraldine K Wallbank | Anne Tiedemann | Zoe A Michaleff | Kirsten Howard
| Lindy Clemson | Sally Hopewell | Sarah E Lamb

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- 108 trials, 23,407 participants.
- Exercise reduces the rate of falls by 23% (balance/functional 24%, 39 RCTs, n=7920).
- Exercise reduces the risk of falls by 15% (balance/functional 13%, 37 RCTs, n=8288).
 - No difference in effect between participants at increased risk of falling or not.
 - Little important difference seen in health-related quality of life.
- Multiple types of exercise (commonly balance/functional + resistance) reduce rate of falls by 34% (11RCTs, n=1374), and risk of falls by 22% (17RCTs, n=1623).
- Tai Chi reduced rate of falls by 19% (7 RCTs, n=2655) and risk of falls by 20% (8 RCTs, n=2677).
- Unclear effects from resistance training, dance or walking.

Exercise: a meta analysis

Exercise to prevent falls in older adults: an updated systematic review and meta-analysis

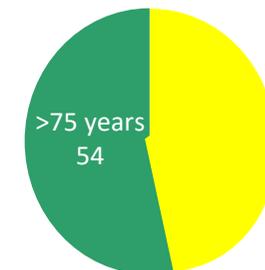
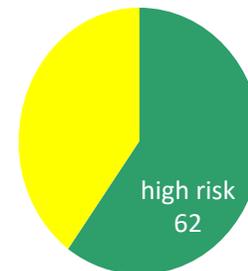
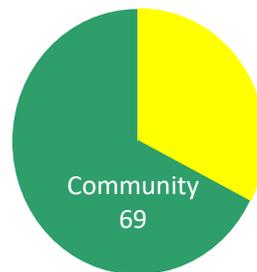
Catherine Sherrington,¹ Zoe A Michaleff,^{1,2} Nicola Fairhall,¹ Serene S Paul,¹ Anne Tiedemann,¹ Julie Whitney,³ Robert G Cumming,⁴ Robert D Herbert,⁵ Jacqueline C T Close,^{5,6} Stephen R Lord⁵

British Journal of
Sports Medicine

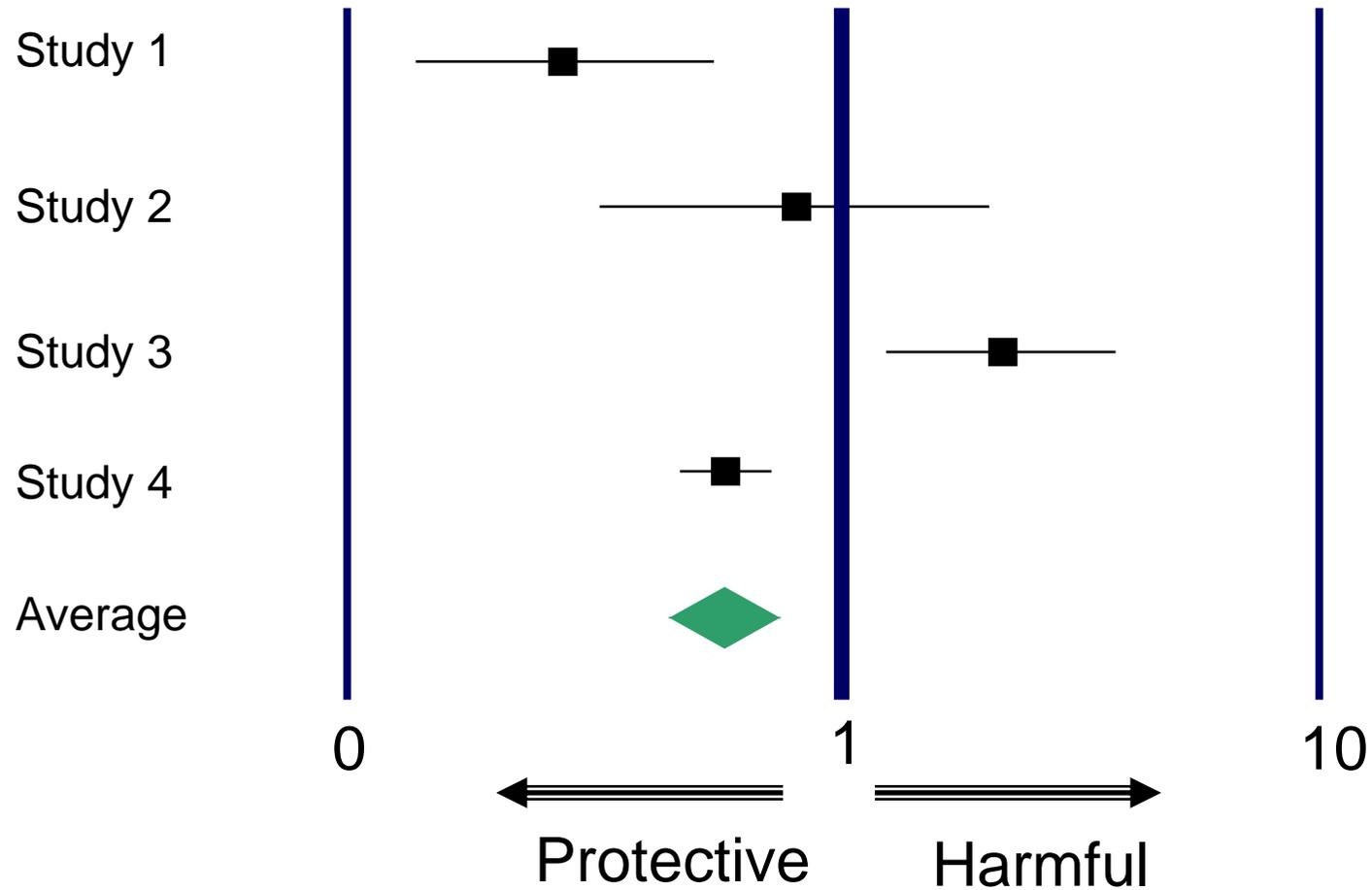
doi:10.1136/bjsports-2016-096547

99 comparisons
(88 trials)

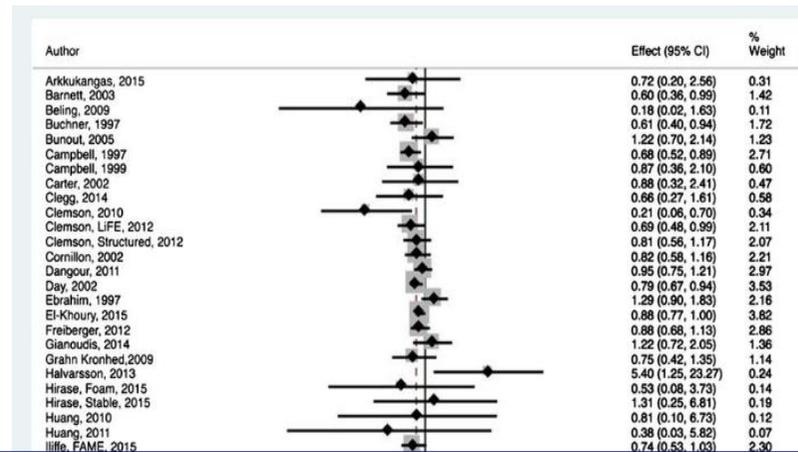
19 478 subjects



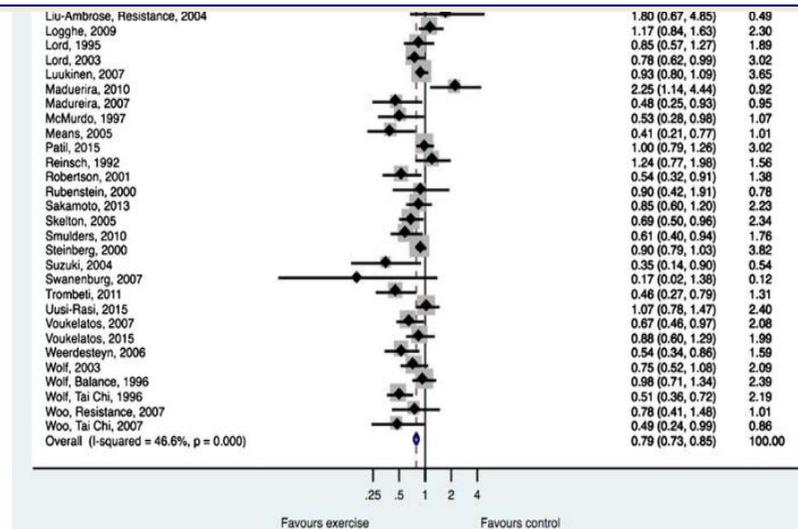
How to interpret a meta analysis



Effects of exercise – Community dwellers



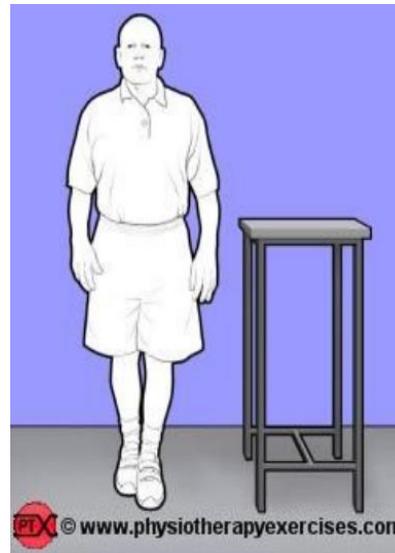
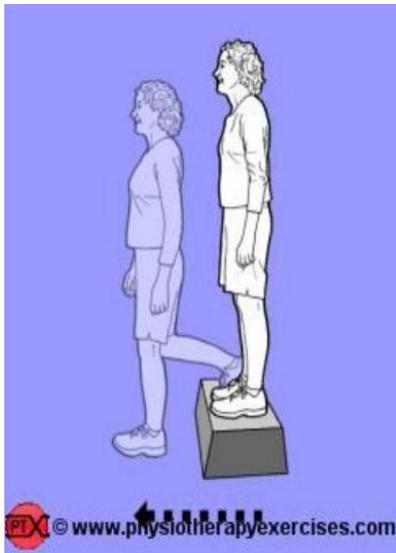
relative risk (RR) = 0.79, 95% CI = 0.73-0.85
21% reduction



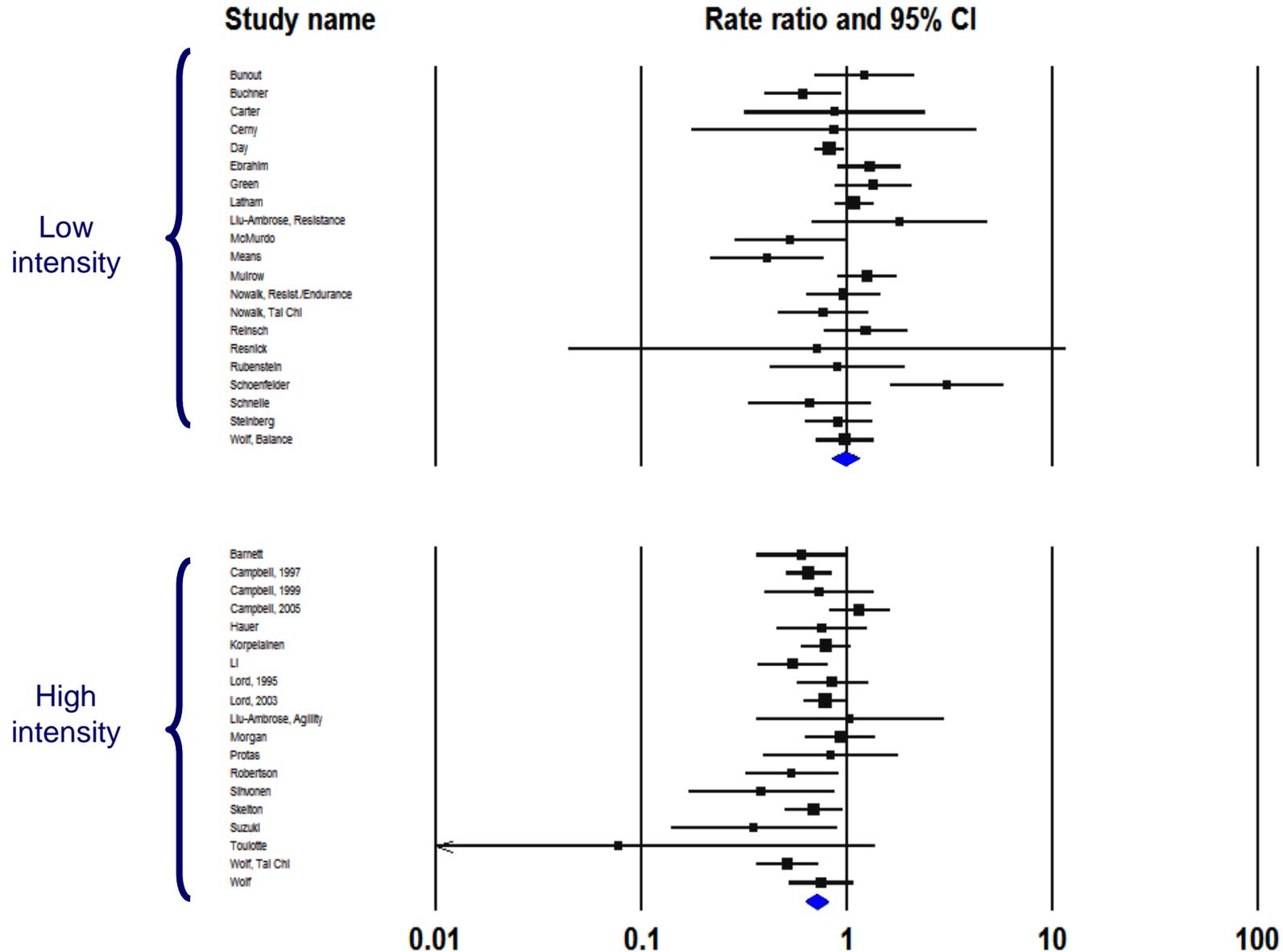
Balance intensity

Definition of HIGH CHALLENGE balance training

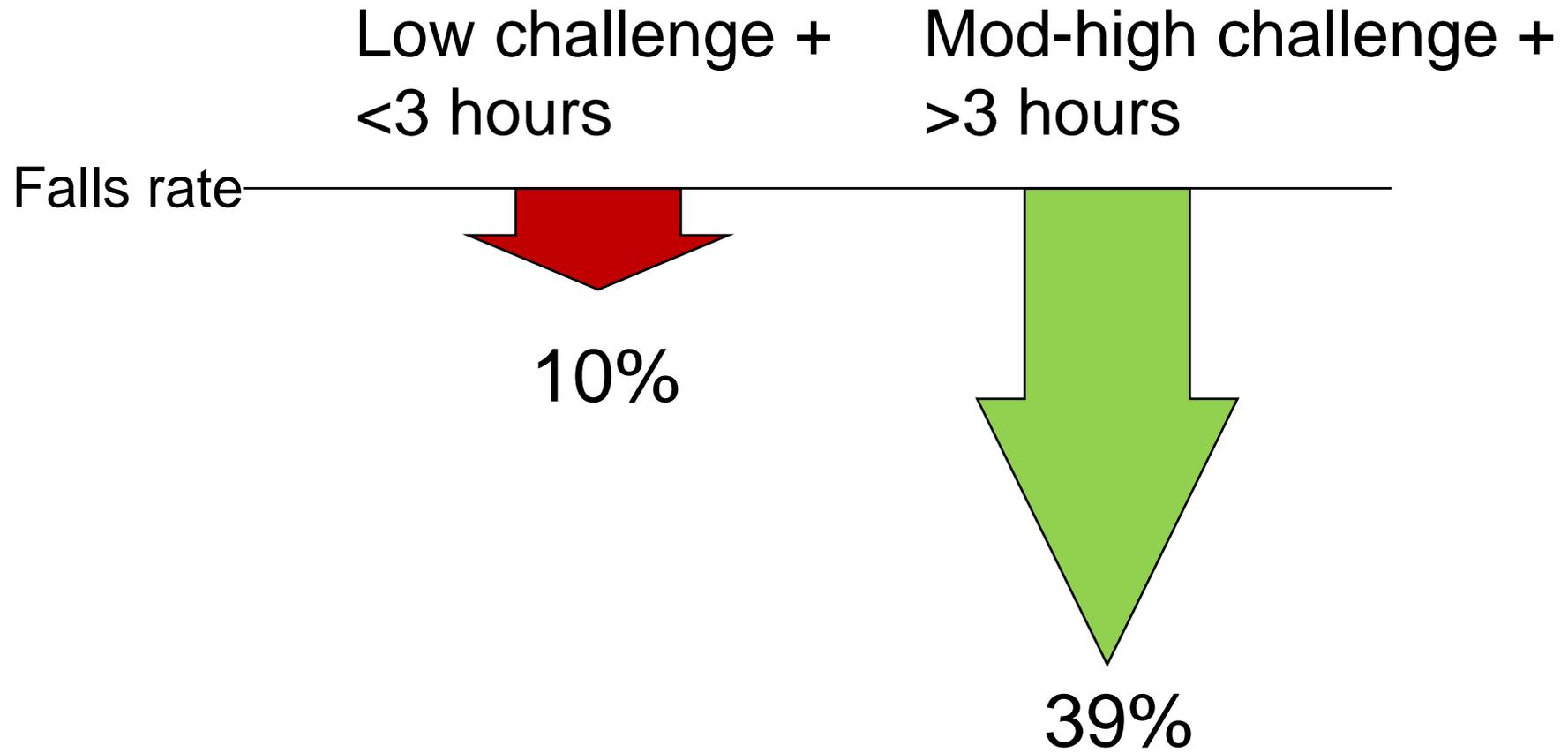
- exercise while standing and:
 - movement of the centre of mass
 - narrowing of the base of support
 - minimising upper limb support



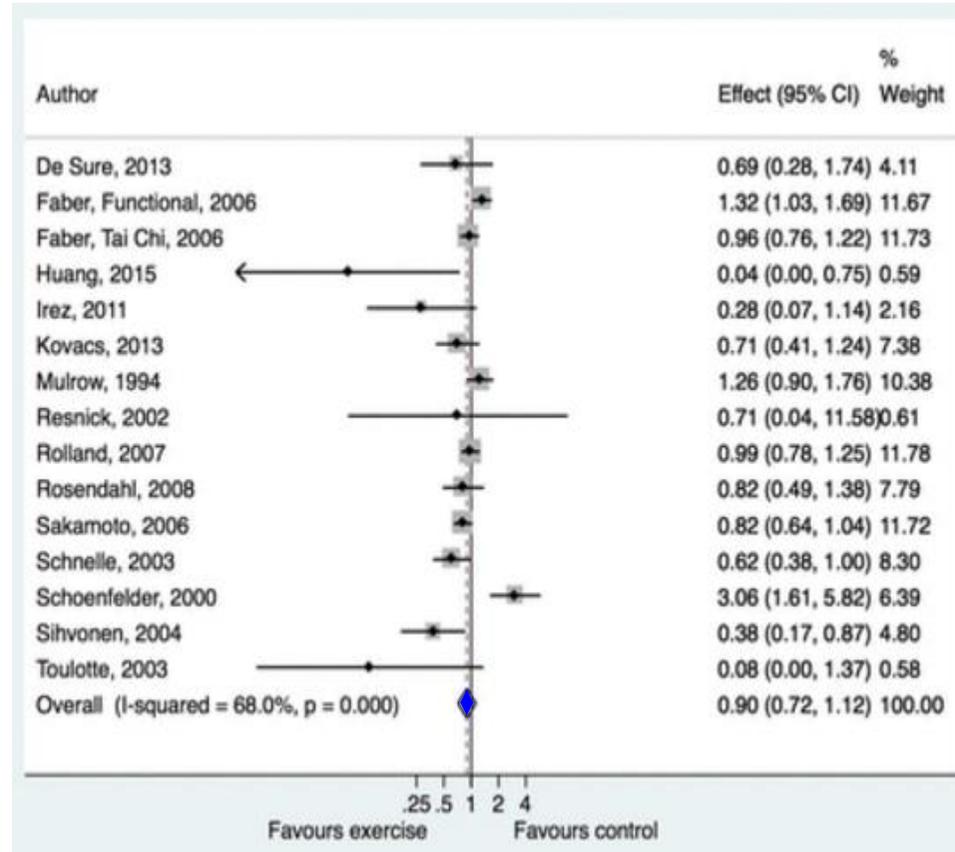
Balance training intensity



Balance intensity + dose effects



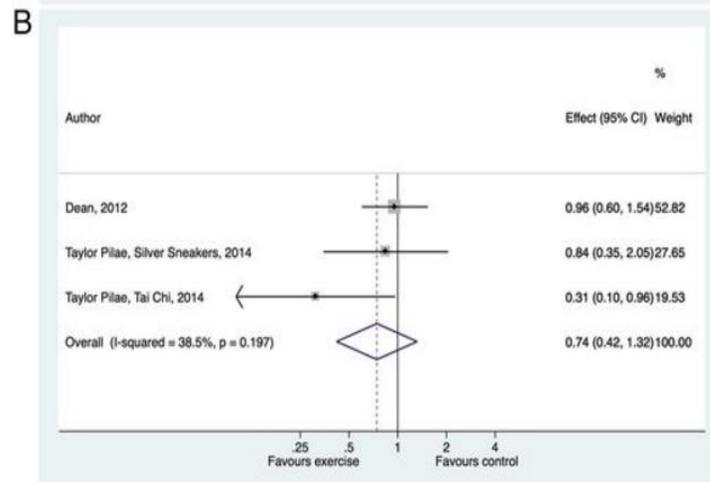
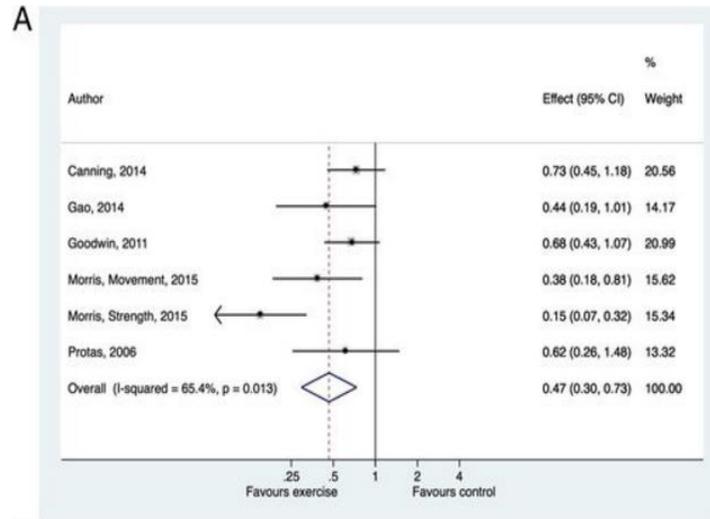
Effects of exercise – care facilities



relative risk (RR) = 0.90 (0.72 to 1.12)
non-significant reduction

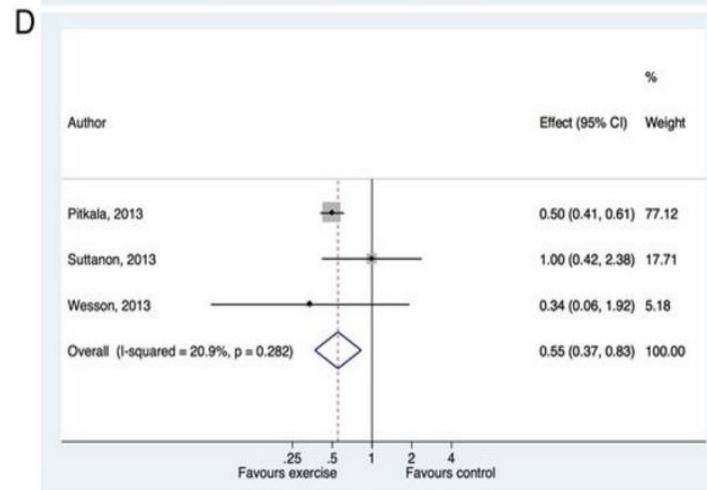
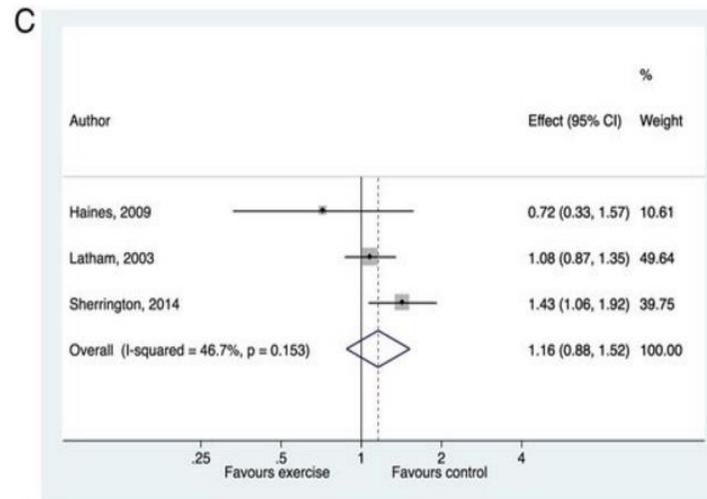
Effects of exercise – clinical groups

Parkinson's disease



Stroke

Recent hospital discharge



Cognitive impairment

Meta analysis – summary results

The greatest effects of exercise on falls in community dwellers (39% reduction) were obtained from programs that **challenged balance** to a moderate-high extent, and had **3+ hours total dose** of exercise.

<u>risk</u>	<u>effect on falls</u>
1. Mod-high-challenge balance training	21% reduction
2. Total dose 3+ hours	30% reduction
- both factors together	39% reduction

Meta analysis – summary results

Exercise also significantly reduced falls in:

- community-dwelling people with Parkinson's disease (53% reduction)
- cognitive impairment (45% reduction)



No evidence of a fall prevention effect of exercise in:

- residential care settings
- stroke survivors
- people recently discharged from hospital.



Exercise intervention examples

The Otago Exercise Program

- Comprises **home-based strength and balance** exercises
- 4-5 sessions for prescribing and progressing the exercises and walking plan
- One hour for first visit and 30 minutes for follow ups
- 3 times a week for ~30 minutes

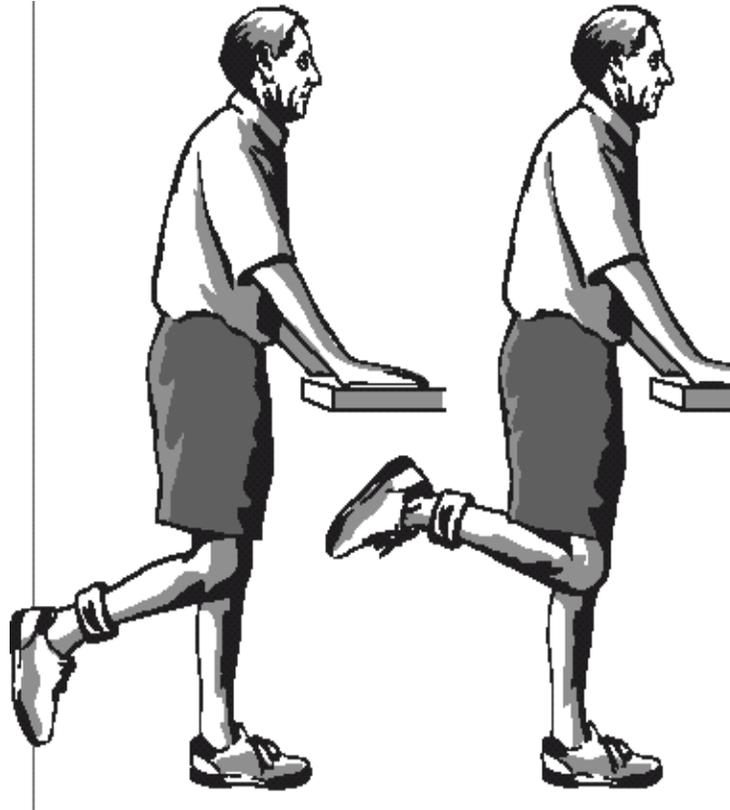
- Developed and tested in 4 research studies
- Effective in reducing falls by 35%
- Most beneficial in high risk groups (over 80, previous falls)

Strengthening exercises

Front Knee
Strengthening



Back Knee Strengthening



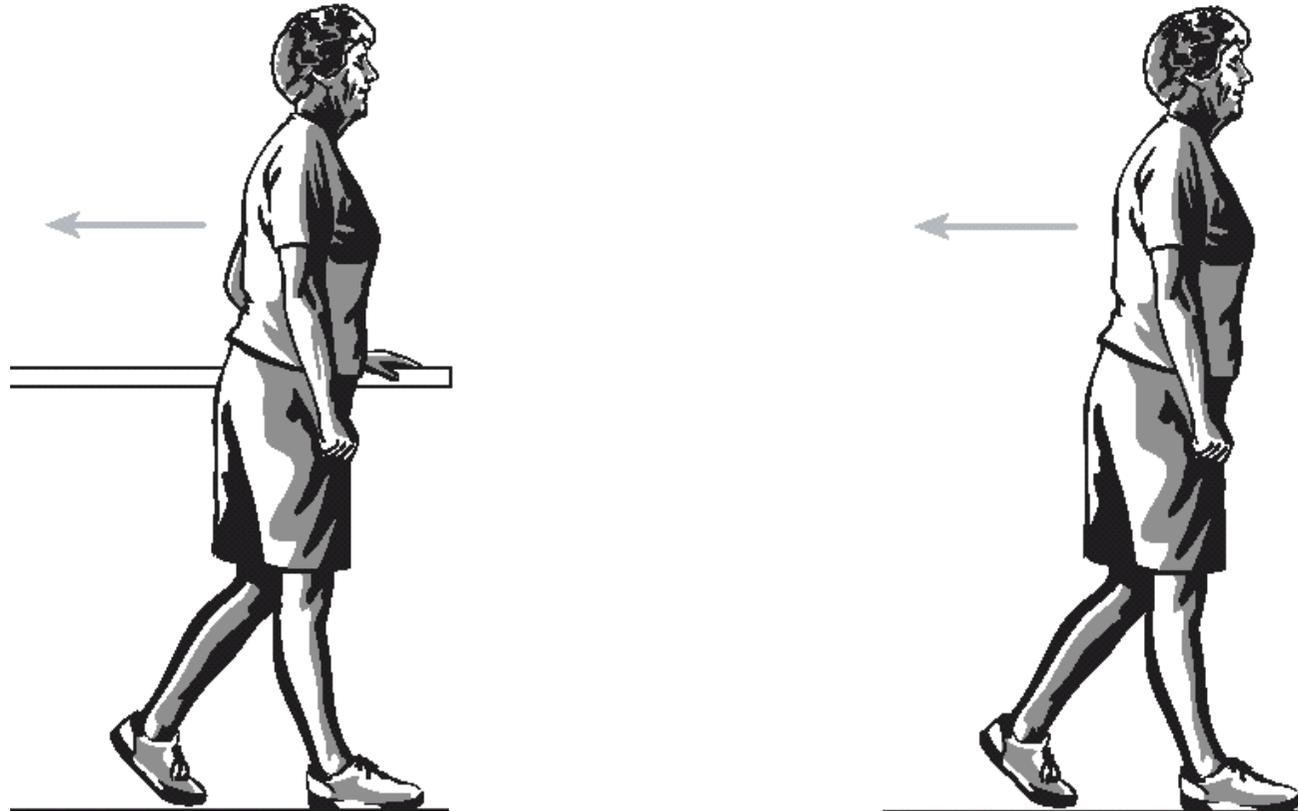
Side Hip
Strengthening



Try and use ankle weights whenever possible. People aged 80 and over will start with 1-2 Kg. Need to be able to do 8-10 reps before fatigue.

Balance exercises

Backwards walking (with/without support)



Ensure person can recover balance using lower limb strategies before prescribing exercise without support

Tai Chi

Initial study (Wolf et al, 1996)

- 200 **community-dwelling people**, mean age 76 years
- 15 week program
- Multiple falls reduced by 47.5% over 12 months

Follow-up study (Wolf et al, 2003) of

- **frail older people**
- NO significant reduction in falls

Wolf et al. JAGS 1996;44(5):489-97.

Wolf et al. JAGS 2003; 51(12):1693-701.



Group exercise

- 165 independently-living adults 65-85 years
- Identified as having a strength or balance impairment
- Weekly class with home exercise for 12 months
- Significant improvements in:
 - Balance
- No significant differences for:
 - Strength, sit-to-stand times, walking speed

40% reduction in falling rates in intervention group

Barnett et al. Age and Ageing 2003;32:1685-1692.

LiFE: Lifestyle & Functional Exercise

- Lifestyle approach to reducing falls through balance and strength training
 - home based
 - individually tailored balance and strength training embedded within daily routines
 - visits by therapists
 - phone call follow up
- **Reduced rate of falls by 31%**



Clemson et al. 2010. Aust OT Journal, 57,42-50.
Clemson et al. 2012. BMJ 2012;345:e4547

Exercise in Community Summary

- **Strong evidence**
 - balance training
- **Moderate evidence**
 - weight bearing group exercise with balance exercises
 - strength training
 - Tai Chi
- **Little evidence**
 - general fitness training
 - walking
 - seated exercise
 - water exercise
- **Emerging evidence**
 - perturbation training

What should a program include?

For falls prevention benefits

- safely challenge balance
- offer ongoing exercise
- only include walking if safe and not at the expense of balance training

... other health benefits may be gained from

- strength training
- increased physical activity

Cochrane Review – Care Facilities



Interventions for preventing falls in older people in care facilities and hospitals

Cochrane Systematic Review - Intervention | Version published: 07 September 2018 [see what's new](#)



57

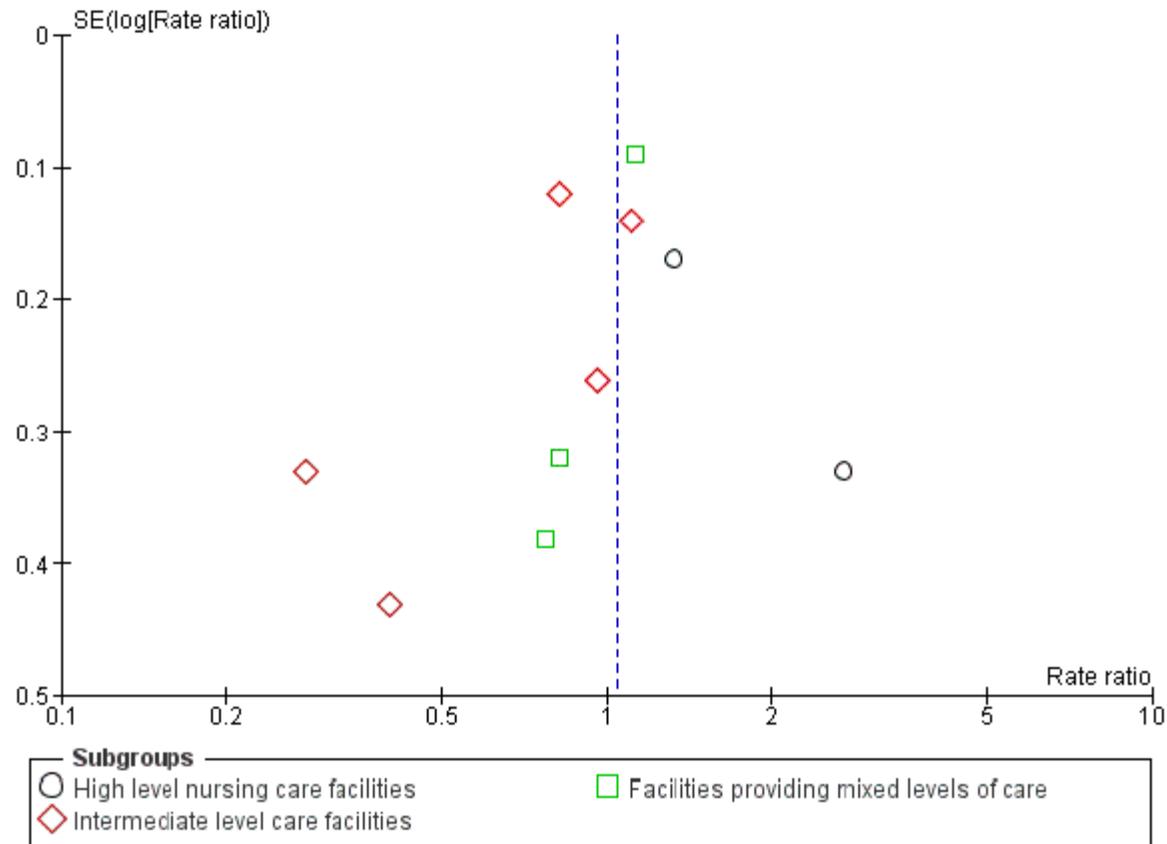
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✉ Ian D Cameron | Suzanne M Dyer | Claire E Panagoda | Geoffrey R Murray | Keith D Hill | Robert G Cumming
| Ngaire Kerse

www.thecochranelibrary.com

- 95 trials (138,164 participants),
 - 71 in care facilities and 24 in hospitals.
- Care Facilities:
 - Exercise has little or no effect to the risk of falling.
 - General medication review may make little or no difference to the rate of falls or risk of falling.
 - Vitamin D supplementation probably reduces rate of falls by 28% but not risk of falling.
 - Multifactorial intervention effects uncertain.
- Hospital:
 - Additional physiotherapy effects uncertain.
 - Bed sensor alarm provision uncertain.
 - Multifactorial interventions may reduce rate of falls by 20%, mostly in subacute setting.

Exercise vs usual care – care facilities



Exercise as medicine.....

Type

Dosage

Frequency

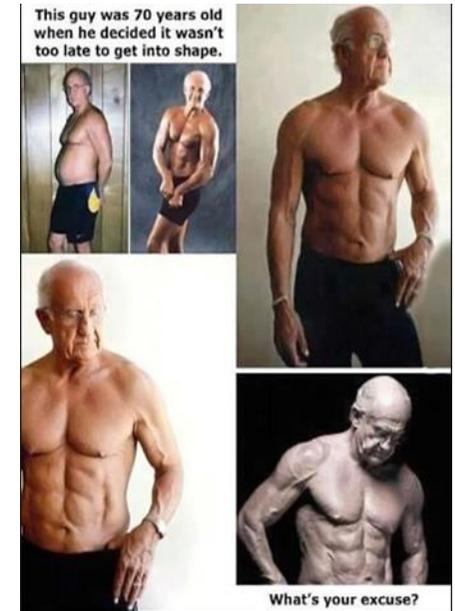
All matter...



*Would I prescribe half
an aspirin pd for COPD?*

Components of effective exercise programs

- ✓ Total dose of exercise – 50 hours minimum
- ✓ High level balance work
- ✓ Strength work for those who are deconditioned
- ✓ All exercises individually upgraded – progressed
- ✓ Close supervision – to allow for safe inclusion of high level balance work
- ✓ Maintenance program continued after initial conditioning phase
- ✓ Walking program (while beneficial for other health conditions) should not be considered a falls prevention program



(Sherrington et al 2011, Tiedeman et al 2011)

Discussion

- evidence
 - assumptions
 - knowledge
 - practical skills
-
- sustainability
 - reach
 - dose
 - individualisation

Home and Recreational Safety

- Home & Recreational Safety
- Older Adult Falls -
- Important Facts about Falls
- Costs of Falls
- Hip Fractures Among Older Adults
- Older Adult Falls Programs -
- Compendium of Effective Fall Interventions, 3rd Edition**
- Preventing Falls: Implementation Guide
- Publications and Resources
- STEADI Initiative for Health Care Providers
- Water-Related Injuries +
- Poisoning +
- Fires

[CDC](#) > [Home & Recreational Safety](#) > [Older Adult Falls](#) > [Older Adult Falls Programs](#)

CDC Compendium of Effective Fall Interventions: What Works for Community-Dwelling Older Adults, 3rd Edition



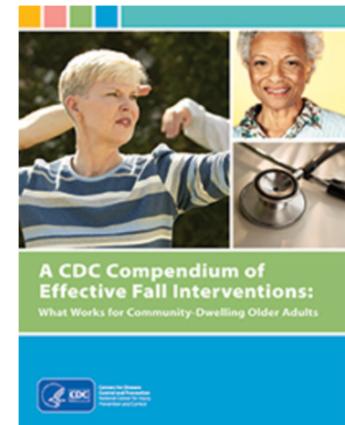
This collection of effective fall interventions is designed to help public health practitioners, senior service providers, clinicians, and others who want to address older adult falls in their community.

This 3rd edition of the *Compendium* describes single interventions (15 exercise interventions, 4 home modification interventions, and 10 clinical interventions) and 12 multifaceted interventions (which address multiple risk factors). Each intervention is presented using a standardized format that includes a short summary and additional implementation details:

- Purpose
- Program setting
- Content
- Number of sessions
- Duration
- Type of provider
- Provider's training
- Key elements
- Available materials
- Contact information for the principal investigator

The Compendium also includes summary tables comparing characteristics of different interventions, a bibliography, and supplemental materials.

Download



[Preventing Falls: A Guide to Implementing Effective Community-Based Fall Prevention Programs](#)

 [PDF - 4 MB]

 **Get Email Updates**

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Exercise

- Stay Safe, Stay Active Barnett, et al. (2003)
- The Otago Exercise Program Campbell, et al. and Robertson, et al.
- LiFE (Lifestyle approach to reducing Falls through Exercise) Clemson, et al. (2012)
- Erlangen Fitness Intervention Freiburger, et al. (2007)
- Senior Fitness and Prevention (SEFIP) Kemmler, et al. (2010)
- Adapted Physical Activity Program Kovacs, et al. (2013)
- Tai Chi: Moving for Better Balance Li, et al. (2005)
- Australian Group Exercise Program Lord, et al. (2003)
- Yaktrax® Walker McKiernan (2005)
- Veterans Affairs Group Exercise Program Rubenstein, et al. (2000)
- Falls Management Exercise (FaME) Intervention Skelton, et al. (2005)
- Music-Based Multitask Exercise Program Trombetti, et al. (2011)
- Central Sydney Tai Chi Trial Voukelatos, et al. (2007)
- Simplified Tai Chi Wolf, et al. (1996)
- Multi-target Stepping Program Yamada, et al. (2013)
- Table 1. Summary Table of studies and Study Population
- Table 2. Study Methodology
- Table 3. Intervention Characteristics

Home Modification

- The VIP Trial Campbell, et al. (2005)
- Home Visits by an Occupational Therapist Cumming, et al. (1999)
- Falls-HIT (Home Intervention Team) Program Nikolaus, et al. (2003)
- Home Assessment and Modification Pighills, et al. (2011)
- Table 1. Summary Table of studies and Study Population
- Table 2. Study Methodology
- Table 3 Intervention Characteristics

Clinical

- Three-Year Study of Vitamin D (Cholecalciferol) Plus Calcium Bischoff-Ferrari, et al. (2006)
- Psychotropic Medication Withdrawal Campbell, et al. (1999)
- Active Vitamin D (Calcitriol) as a Falls Intervention Gallagher, et al. (2007)
- VISIBLE (Visual Intervention Strategy Incorporating Bifocal and Long-distance Eyewear) Study Haran, et al. (2010)
- Vitamin D to Prevent Falls After Hip Fracture Harwood, et al. (2004)
- Cataract Surgery Harwood, et al. (2006)
- Pacemaker Surgery Kenny, et al. (2001)
- Study of 1000 IU Vitamin D Daily for One Year Pfeifer, et al. (2009)
- Quality Use of Medicines Program Pit, et al. (2007)
- Podiatry & Exercise Intervention Spink, et al. (2011)
- Table 1. Summary Table of studies and Study Population Characteristics
- Table 2. Study Methodology
- Table 3 Intervention Characteristics

Multifaceted Interventions

- Stepping On Clemson, et al. (2004)
- PROFET (Prevention of Falls in the Elderly Trial) Close, et al. (1999)
- Accident & Emergency Fallers Davison, et al. (2005)
- The NoFalls Intervention Day, et al. (2002)
- The SAFE Health Behavior and Exercise Intervention Hornbrook, et al. (1994)
- Falls Team Prevention Program Logan, et al. (2010)
- KAAOS (Falls and Osteoporosis Clinic Palvanen, et al. (2014)
- Multifactorial Fall Prevention Program Salminen, et al. (2009)
- Nijmegen Falls Prevention Program (NFPP) for adults with Osteoporosis Smulders, et al. (2010)
- The Winchester Falls Project Spice, et al. (2009)
- Yale FCSIT (Frailty and Injuries: Cooperative Studies of Intervention Techniques) Tinetti, et al. (1994)
- A Multifactorial Program Wagner, et al. (1994)
- Table 1. Summary Table of studies and Study Population Characteristics
- Table 2. Study Methodology
- Table 3 Intervention Characteristics

www.physiotherapyexercises.com

The screenshot shows the website interface with a search bar on the left containing 'Search For Exercises' and 'Show Examples'. The main content area features a central heading: 'Physiotherapyexercises.com is a FREE tool to create exercise booklets for people with injuries and disabilities'. Below this, two circular icons represent the search and examples functions. To the right, there are three sample exercise booklet pages with illustrations and text. The top navigation bar includes a search icon, the site name, and a language dropdown set to 'English'. The bottom of the page features mobile device icons and a footer with a World Confederation for Physical Therapy logo and text.

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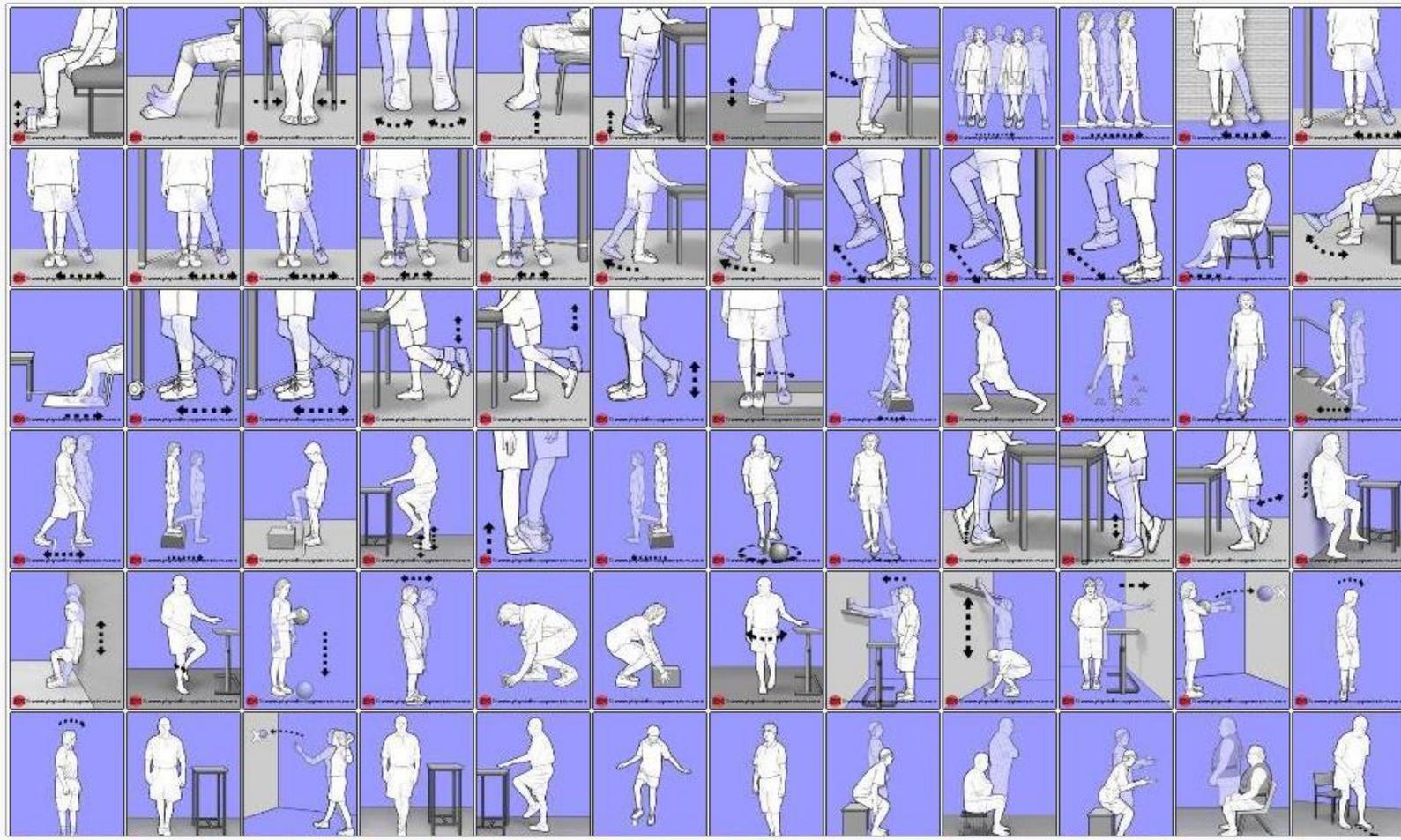
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108/950 Exercises, 0/21 Video clips

- Search
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 - Mobilising in wheelchair 14
 - Moving into standing 57
 - Maintaining a standing position 104
 - Walking 131
 - Climbing stairs 31
 - Running 37
 - Jumping and hopping 24
 - Speaking and swallowing 10
 - Preventing Falls 108
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Falls Prevention Workshops

Get started today



For Allied Health

Home and community safety course, training, resources and continuing professional development for occupational therapists and other healthcare professionals interested in falls prevention.



For General Practitioners

Learn how to prevent falls in older patients using evidence-based interventions. QI & CPD accredited courses, resources and GP clinical audit available.

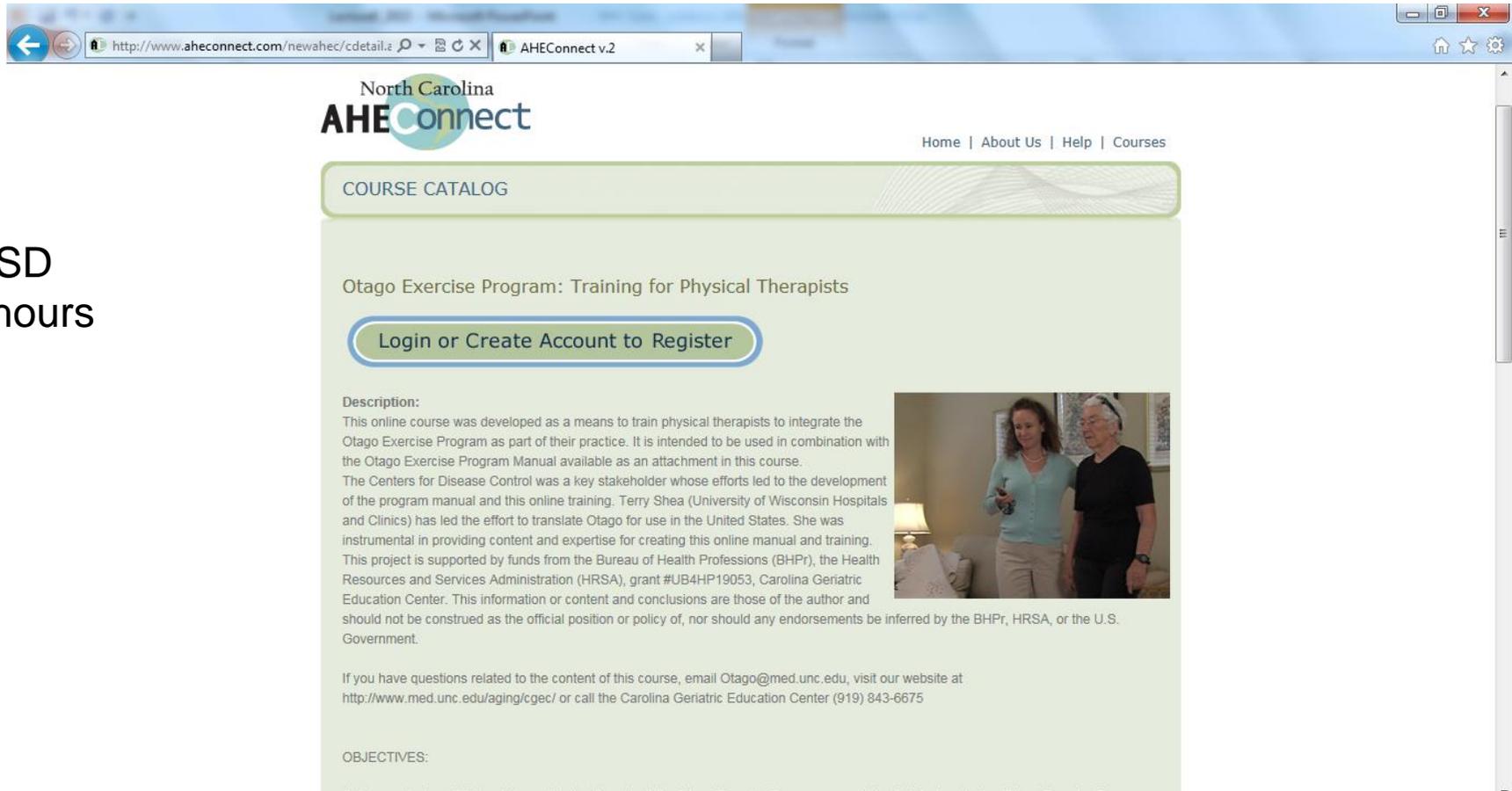


GP Fall Risk Assessment

An online tool that assists GPs screen patients for fall risks and recommend tailored interventions.

Otago online training course

www.med.unc.edu/aging/cgec/



The screenshot shows a web browser window with the URL <http://www.aheconnect.com/newahec/cdetail.asp>. The page header includes the North Carolina AHEConnect logo and navigation links for Home, About Us, Help, and Courses. The main content area is titled 'COURSE CATALOG' and features a card for the 'Otago Exercise Program: Training for Physical Therapists'. A prominent button reads 'Login or Create Account to Register'. Below this, a 'Description' section provides details about the course's development and funding. To the right of the text is a photograph of a woman and an older man standing together. At the bottom of the card, there is a section for 'OBJECTIVES:'.

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COURSE CATALOG

Otago Exercise Program: Training for Physical Therapists

Login or Create Account to Register

Description:
This online course was developed as a means to train physical therapists to integrate the Otago Exercise Program as part of their practice. It is intended to be used in combination with the Otago Exercise Program Manual available as an attachment in this course. The Centers for Disease Control was a key stakeholder whose efforts led to the development of the program manual and this online training. Terry Shea (University of Wisconsin Hospitals and Clinics) has led the effort to translate Otago for use in the United States. She was instrumental in providing content and expertise for creating this online manual and training. This project is supported by funds from the Bureau of Health Professions (BHP), the Health Resources and Services Administration (HRSA), grant #UB4HP19053, Carolina Geriatric Education Center. This information or content and conclusions are those of the author and should not be construed as the official position or policy of, nor should any endorsements be inferred by the BHP, HRSA, or the U.S. Government.

If you have questions related to the content of this course, email Otago@med.unc.edu, visit our website at <http://www.med.unc.edu/aging/cgec/> or call the Carolina Geriatric Education Center (919) 843-6675

OBJECTIVES:

Cost= \$35 USD
Duration= 3 hours

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