

Debunking the myths of exercise to prevent falls

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Summary of session

- How the guidelines for physical activity in older adults will help in primary falls prevention
- A reminder of the specificity of exercise to prevent falls in those with a history of falls
- A sound telling off if you cherry pick bits of effective interventions!
- Transition into ongoing exercise services to ensure ongoing effect
- Suggestions of transitions

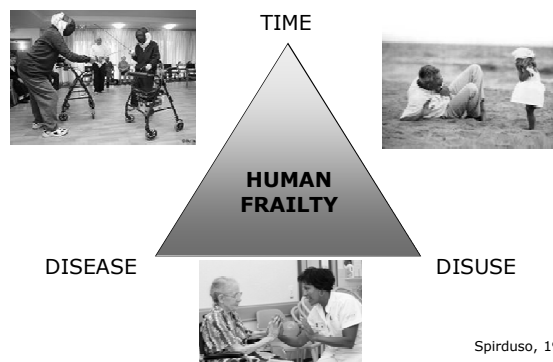


Major risk factors

	All fallers (Odds Ratio)	Recurrent Fallers (Odds Ratio)
History of Falls	2.8	3.5
Gait Problems ←	2.1	2.2
Walking Aids Use ←	2.2	3.1
Vertigo	1.8	2.3
Parkinson's Disease	2.7	2.8
Antiepileptic Drug Use	1.9	2.7
Physical Disability ←	1.6	2.4
Disability in Instrumental Activities in Daily Life	1.5	2.0
Fear of Falling	1.6	2.5

Deandrea S et al. Epidemiology. 2010;21: 658-668.

3 Dimensions of Human Frailty



Spirduso, 1995

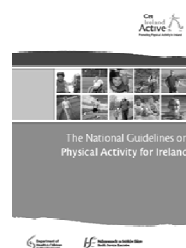
Active Ageing.....

- >3 hrs per week targeted exercise
 - Osteoporosis - 2 x less likely
 - Hip fracture - 2 x less likely
- >3 hrs per week on your feet
 - Reduced risk of falls and fractures
- New PA Recommendations highlight the need for additional strength and balance training activities over and above the moderate physical activity messages



ACSM 2007; CDC 1996,2002; Sesso 2000; Nicholl 1994; WHO 1997; NIA 1998; BHF 2010; CMO 2011

Physical Activity Guidelines for Older Adults



The National Guidelines on Physical Activity for Ireland
Department of Health and Children, Health Service Executive (2009)

Older adults – Moderate intensity – accumulating 150 minutes per week

- Every older person should be active.
- Some physical activity is better than none, more is better than some, and if you take part in any amount of physical activity you gain some health benefits.
- You can count shorter bouts of activity towards the guidelines. These bouts should last for at least 10 minutes. At least 30 minutes a day of moderate intensity activity on five days a week, or 150 minutes a week.
- Focus on aerobic activity, muscle-strengthening and balance.



Health Service Exec 2009, + CMO, Start Active Stay Active, 2011

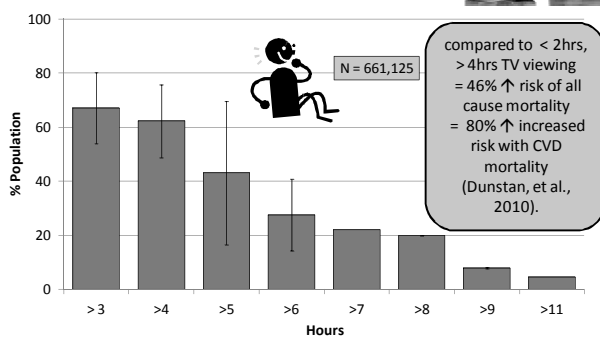
Older Adults – Sedentary, Strength and Balance

- Add activities which increase muscular strength and balance on 2 – 3 days per week to reduce your risk of falls.
- **All Older adults should minimise the amount of time spent being sedentary (sitting) for extended periods.**



Health Service Exec 2009, + CMO, Start Active Stay Active, 2011

Prevalence of Sitting in Older Adults



With thanks to Juliet Harvey, Seb Chastin

It's never too late to exercise

- The lower the baseline level of physical activity, the greater the health benefit associated with an increase in physical activity (Haskell 1994)
- A 12 week high Intensity Strength Training programme in >90 yr olds doubled their strength (Fiatarone, 1990)



But is it the answer for all?

When do we become "fallers" instead of "trippers"?



When intrinsic abilities to remain upright cannot cope with extrinsic risk factors

Nervous system, reaction times and gait speed slows

Balance and strength deteriorates

Fracture site changes with age, wrist fractures more common in younger people, hip fractures more common in older people

Exercise to Prevent Falls

Exercise could help fallers in a number of ways:

- Reducing Falls (or injurious falls)
- Reducing known Risk Factors for Falls
- Reducing Fractures ? (or changing the site of fracture)
- Increasing Quality of Life & Social Activities
- Improving bone density
- Reducing Fear
- Reducing Institutionalisation



Sherrington et al 2008, 2011, Davis 2010, Campbell 2007

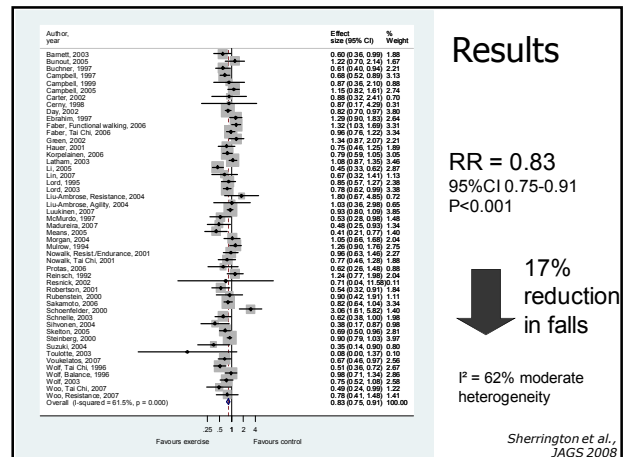
Effective exercise for the prevention of falls – a systematic review and meta-analysis

C Sherrington, JC Whitney, SR Lord, RD Herbert, RG Cumming, JCT Close

44 RCTs - 9603 participants JAGS, 2008

C Sherrington, A Tiedemann, N Fairhall, JCT Close, SR Lord

54 RCTs NSW Pub H Bull, 2011



What makes the difference?

- Greatest effects of exercise on fall rates from interventions including:

- Highly challenging balance training
- High dose
- No walking program



- These 3 factors explained 68% of variance

Sherrington et al., JAGS 2008

Highly challenging Balance Training



24%

(95%CI = 0.62 to 0.93)
73 studies

- Exercise in standing involving:
 - movement of the centre of mass
 - narrowing of the base of support
 - minimising upper limb support



Sherrington, 2011

High Dose



23%

(95%CI = 13 to 32%)
30 studies

- 50+ hours
 - At least 2 hours a week of exercise for at least 6 months
 - Home or group-based or a combination of both



Sherrington, 2011
Sherrington et al., JAGS 2008 in press

Does exercise work for all?

- Did any exercise programmes increase risk??



Brisk walking !!

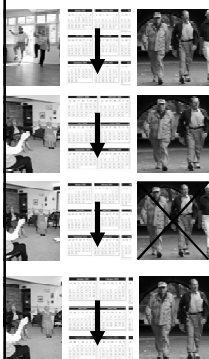
- Women, previous upper arm fracture
- Excluded
 - bisphosphonates, survival < 1yr, cognitive impairment, too frail
- Intervention: Brisk walking
- Control: exercise of upper arm
- Falls risk (Brisk walking > control)
- Fracture risk (Brisk walking > control)



Ebrahim et al. (1997)



Adjusted effects of exercise on falls



No reduction:
RR 0.95 (0.78 to 1.16)

High balance
Low dose
Walking

No reduction:
RR 0.96 (0.80 to 1.16)

Low balance
High dose
Walking

No reduction:
RR 0.91 (0.79 to 1.05)

Low balance
Low dose
No walking

Increased risk:
RR 1.20 (1.00 to 1.44)

Low balance
Low dose
Walking

What if they see better?

- Can providing single lens distance glasses to regular users of multifocal glasses lower the rate of falls?
- YES - by around 40% in people who regularly took part in outside activities (incidence rate ratio 0.60, 95% CI 0.42 to 0.87).
- BUT - In frailer people, who spent more time inside, no significant difference was seen in falls inside and a significant increase was seen in falls outside.

Haran MJ et al. VISIBLE randomised controlled trial. BMJ 2010;340:c2265

++ Balance, high dose and NO walking



38%

(95%CI = 27 to 46%)
8 studies

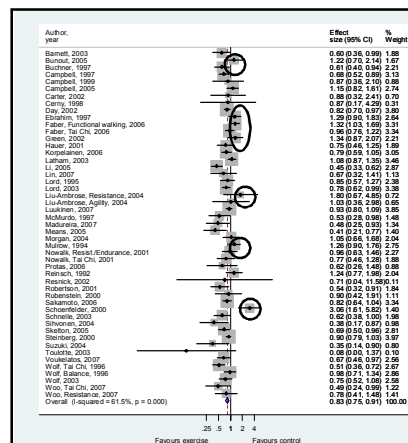
If include studies with a walking programme as well as ++ balance and high dose then the reduction in risk of falls is more modest = 21% (95% CI = 11 to 30%), 14 studies

Sherrington, 2011

Hidden perils

Apart from brisk walking....

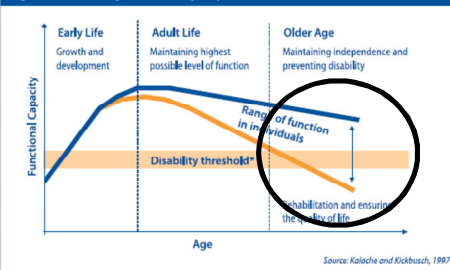
What other characteristics of the programme or the participants increased risk of falls?



Sherrington et al., JAGS 2008, 2011

WIDE RANGE OF ABILITIES AND NEEDS

Figure 4. Maintaining functional capacity over the life course



For whom is exercise unsafe?



Absolute contra-indications to exercise 1

- Uncontrolled angina
- Recent myocardial infarction
- Resting systolic blood pressure >180 mmHg or resting diastolic BP of >100mm Hg
- Significant drop in BP during exercise
- Uncontrolled resting tachycardia >100 beats per minute
- Unstable or acute heart failure
- New or uncontrolled arrhythmia
- Severe stenotic or regurgitant valvular heart disease
- Hypertrophic obstructive cardiomyopathy
- Third degree heart block
- Acute aortic dissection
- Acute myocarditis or pericarditis

(ACSM 1995, Dinan 2001, Quittian M 1994, Mead G 2005, ACSM 2009, Rimmer J 2005, BACR 2007)

Absolute contra-indications to exercise 2

- Acute pulmonary embolus or pulmonary infarction
- Deep venous thrombosis
- Unstable diabetes
- Uncontrolled visual or vestibular disturbances
- Febrile illness
- Extreme obesity, with weight exceeding the recommendations or the equipment capacity (usually >159kg [350 lb.])
- Recent injurious fall without medical assessment
- Proven inability to comply with the recommended adaptations to the exercise programme and inability to maintain an upright posture in sitting

(ACSM 1995, Dinan 2001, Quittian M 1994, Mead G 2005, ACSM 2009, Rimmer J 2005, BACR 2007)

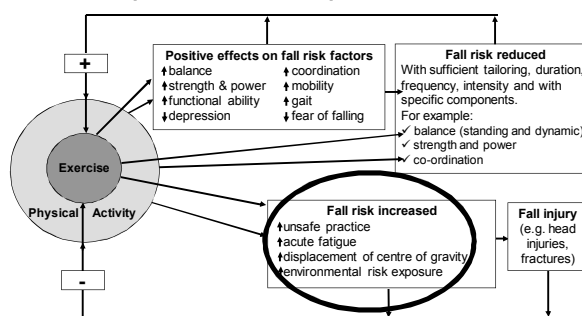
Potential Dangers of Exercise



Type of Exercise	Reoccurrence of Fracture
• Back extension	16%
• Flexion (abd. curls)	89%
• Combined	53%
• No exercise	67%

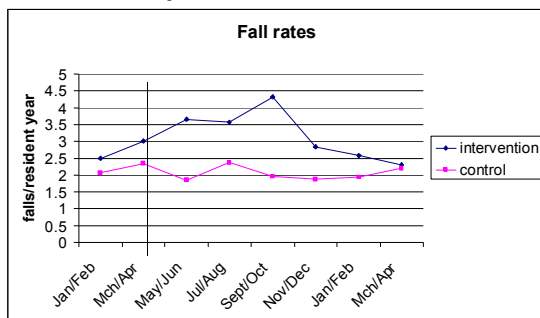
Sinaki & Mickelson 1982

Proposed Conceptual Model



Adapted from Skelton, 2001, Age Ageing

Risky intervention?

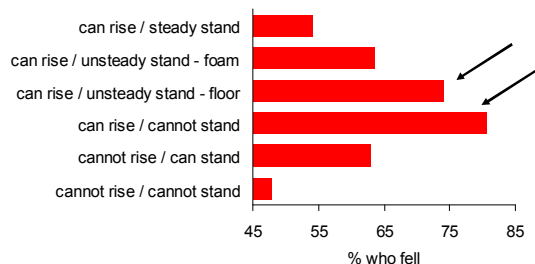


Care home intervention including increasing low intensity physical activity.
Kerse et al. 2004.

Frailty & Exercise Too confident Too soon?

- Frailty index applied to participants in an exercise programme.
 - Those considered frail had RR 2.95 (95% CI 1.64 to 5.32 for a fall compared to those considered pre-frail who decreased risk of falls RR 0.39 (95% CI 0.18 to 0.88)
Faber et al 2006
- Three trials have reported more falls in the intervention groups DURING the intervention.
 - There is a risk of a persons confidence increasing before they have improved balance and strength to cope with increased exposure to risk
Mulrow 1994, Barreca 2004, Kerse 2004
 - In Stroke patients, practicing sit to stand manoeuvre without then training gait and mobility, increased falls....
Barreca 2004

Risk Factors for falls in NH



Lord 2003

Exercise alone? In high risk

Not beneficial in care home residents
RR 1.16 [0.81-1.65]

Sherrington et al, 2008

? Because the balance challenge is rarely great enough

? Too much focus on "safe" chair based exercise

Needs strength and power focus too?

Transfer training?



Older Person specific

- Adapting** = the condition specific adaptations (modifications) to session aims, structure, content, teaching and programming that need to be made to ensure optimal safety and effectiveness with all participants with osteoarthritis, diabetes etc
- Tailoring** = the highly individual prescriptive solutions (adjustments/exclusions/additions) that are required to tailor the adapted exercise intervention to each participants health, functional, psychosocial/ emotional needs

Dinan 2001, 2007

TARGETED RESISTANCE TRAINING

Weights, bands and body weight including targeted bone loading

- for leg & ankle strength
- for wrist, spine & hips
- open & closed chain



Unipedal standing for the oldest?

- RCT, n= 94 postmenopausal women
 - Control vs Exercise
 - Exercise – 6 months, single leg stand for 1 min per leg 3 x per day
 - Those aged ≥ 70 years (n=31) had significant increase in hip BMD
 - Those aged <70 did not
 - Suggesting different exercise for different aged populations?



J Bone Min Metab 2009 - Sakai et al

Addressing balance in frailty



- 4 weeks 3 x p/w (5-20mins)
- Improvements in
- Ankle Strength
 - Lower limb Power
 - Balance (TUSS and sway)
 - Balance confidence
 - Functional Reach
 - Timed Up & Go

Skelton, Simey and Dinan (2001) - Data presented at the 2nd National Conference on Falls and Postural Stability, Royal College Physicians, London

High intensity training in Nursing Homes

- 9 nursing facilities
- Aged up to 100
- MMSE 10 or greater
- 29 sessions over 3 months
- Functional, weight bearing STANDING exercise
- Significant improvements in balance independent of cognition or depression status

Littbrand, 2011

- ++ Never too late to improve strength
- Aged up to 100
- Improvements in strength

Fiatarone, 1990

Patients in Hospital

Tai Chi + reaching + stepping + transferring chair to chair

- 1 physiotherapist to max 4 patients, 3 x p/w, 45 mins.
- 173 patients, 82 yrs, sub-acute ward
- Halved the number of falls (participant days in hospital)

Haines et al. Clin Rehab 2007; 21:742-753

Early physio review, individualised graduated exercise program and diary, encouragement of functional independence by nursing staff

- 124 consecutive inpatients aged 65 and older admitted from the emergency department to control or intervention medical ward.
- Significant improvement in functional status, reduction in delirium, trend to reduced falls

Mudge AM et al. J Am Geriatr Soc. 2008 Apr;56(4):630-5

Transitional Phase Example: Falls prevention

- Otago Home Exercise Programme (OEP)
 - 1 yr; 3 x p/w; standing strength and balance; graded walking programme; 6 home visits (physiotherapist, nurse) to progress and tailor exercise but otherwise unsupervised
 - 6 mths; 3 x p/w (1 p/w group, 2 p/w home) exercise instructor
- Falls Management Exercise Programme (FaME/PSI)
 - 9 mths; 3 x p/w (one group, two home); standing strength and balance plus floorwork; specialist exercise instructor to progress and tailor exercise

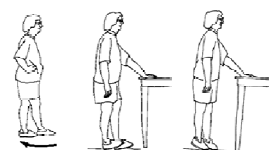
Falls
Injuries
Cost effective >80s
Cost neutral >65s

Cognitive Function

Falls
Quality of Life
Bone Mineral Density
Change of residence
Coping strategies
Long lies

(Campbell 1997; Robertson 2001; Campbell 2005; Liu_Ambrose 2008; Skelton 2005, 2008;)

DYNAMIC BALANCE TRAINING



DYNAMIC BALANCE TRAINING



DYNAMIC ENDURANCE TRAINING

- for balance
- for cardiovascular fitness



1:1 effective programming Stepping Forth with OTAGO

Partnership across sectors to deliver supervised OTAGO strength and balance training to those in the transitional phase.

- 20 staff
- Delivered to 485 people aged 65 and over
- Improved function and balance, walking ability without aids indoors and outdoors – better confidence and improved mood

**NO ADVERSE
EVENTS!!!**



Royal College of Physicians Report March 2012

- Audit on NHS exercise provision in falls services across the UK
- First, the good news!
 - Over 1,700 older people - 96% felt the exercises were beneficial/quite beneficial, and 95% were satisfied/very satisfied with their exercise programme
- Now, the not so good news!
 - 86% low frequency (once per week)
 - 29% of patients used ankle weights for resistance training
 - 52% of patients - exercise programme had been progressed
 - 81% of patients - classes had lasted 12 weeks or less
 - **Only 54% of sites had PSI trained staff and 41% of sites had Otago trained staff**

Falls analysis in the ProAct65+ exercise intervention study



- Multicentre cluster-randomised controlled trial
- Comparing the effects of two exercise programmes with usual care in people aged 65 and over in primary care
- Primary outcome – continuation of exercise
- Falls – secondary outcome
- 1256 participants in London and Nottingham

Steve Iliffe for the ProAct65+ team, UCL, London

Methods



- Recruitment via GP practice and met inclusion criteria:
 - Aged over 65
 - Independently mobile indoors and outdoors and can travel independently to classes
 - No medical exclusions
 - Less than 5 x 30 minutes of exercise per week
 - Less than 3 falls in previous year
- Randomised into:
 - **home exercise** (Otago Home Exercise Programme (OEP))
 - **group exercise** (Falls Management Exercise (FaME)) or
 - **control** (usual care (UC))

Methods



- Falls data collected at baseline and follow up interviews:
 - “How many times have you fallen in the past year?”
 - Falls Risk Assessment Tool (FRAT)
 - Functional balance assessments (Timed get-up and go (TUG), Functional Reach and Modified Clinical Romberg Static Balance test)
 - Falls efficacy (FES-I) and confidence in maintaining balance (ConfBal)
- Prospective, daily falls diaries were utilised during the intervention and 3-monthly recall of falls was collected for 2 years post-intervention
- The data were analysed in SPSS using negative binomial regression modelling

Results: Falls in the three arms of the trial

	FaME	OEP	UC
Falls per person year during intervention	0.80	0.90	0.87
Falls Risk by Exposure - falls per 1000 PA person days during intervention	2.26 (-1.056 to 0.59)	2.62 (-0.742 to 0.140)	2.77
Falls per person year in the 12 months post intervention	0.54 *	0.61	0.70
Rate Ratio (95% CI) in the 12 months post intervention (compared to UC)	0.77 (-0.720 to -0.103) *	0.87 (-0.793 to 0.108)	1.0
Rate Ratio (95% CI) in the 12 to 18 months post intervention (compared to UC)	0.98 (-0.269 to 0.809)	0.96 (-0.423 to 0.606)	1.0

Age UK Expert Series

- Clear easy read
- Reminders of the evidence base
- Good examples of practice
- Good examples of evaluation
- Good examples of transitions on after rehabilitation



Transitioning onto other exercise opportunities

- Vital
 - to meet effective dose requirements
- Important
 - to encourage an active lifestyle beyond rehabilitation
 - to ensure a change in exercise habits and continue to improve social involvement
 - to ensure the opportunities continue to improve strength and balance (eg. not seated!)



NEW! Cue cards with walking advice plus 10 Strength and Balance exercises

NEW! Leaflet for older adults containing the same exercises and simplified information



paths
for all

LET'S GET STARTED WITH THE FIRST EXERCISE... THE FRONT KNEE STRENGTHENER:

You can try this exercise while you are sitting in a chair - try this when watching TV!

Straighten your leg out and then **slowly** lower it again.

Try this 5 times with one leg, then another 5 with the other leg. Build up to 10 times per leg.

Exercise 1 & 2 strengthen the large muscles in your thighs that help you stand up and sit down. This will help with walking and with climbing stairs.

<http://profound.eu.com/>



Join Now – FREE!

Mailing List

Keep up to date as resources added and App launched

<http://profane.co>



<http://fallsdirectory.com>



Conclusions

- Exercise to prevent falls should
 - include highly challenging balance exercises,
 - strength work for lower limbs and ankles and
 - last at least 50 hours in duration
- Avoid brisk walking!
- Home based unsupervised exercise only works if you provide plenty of support and progression
- Don't cherry pick bits of effective interventions – choose the whole package
- Ensure effective transition on after rehabilitation