Exercise – Is it the answer for all older people?

Dr Dawn Skelton
Reader in Ageing and Health
Glasgow Caledonian University
(Ex) Scientific Co-ordinator
ProFaNE

GCU Glasgow Caledonian University

ProFaNE Prevention of Falls Network Europe

Is it?

- Yes
  - If done properly and for long enough, it works for most older people
  - It has much wider benefits than just falls prevention
- No
  - Many won't do it or stick to it
  - Some are too ill to do it
  - Some just don't want to do it!
  - Some need tailoring and adapting of the exercise programme and there is no one there to do that with them (unsafe?)

3 Dimensions of Human Frailty

TIME

HUMAN FRAILTY

DISEASE

DISUSE

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

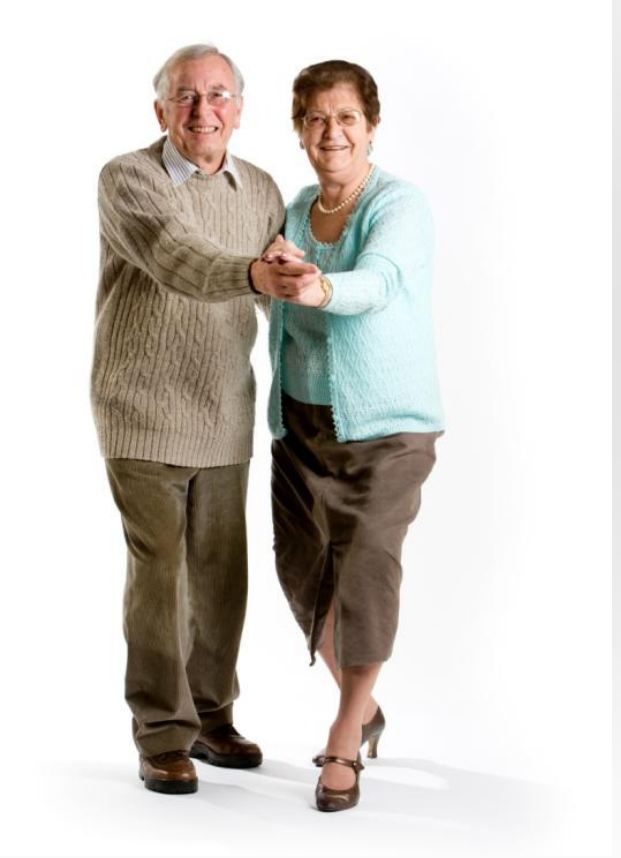
ACSM 2007; CDC 1996,2002; Sesso 2000; Nicholl 1994; WHO 1997; NIA 1998; BHF 2010; CMO 2011

Older adults – Moderate intensity – accumulating 150 minutes per week

OLDER ADULTS (65 +)

- Older adults should aim to be active da
  activity should add up to at least 150 m
  of moderate intensity activity in bouts
  more - one way to approach this is to
  at least 5 days a week.

- For those who are already regularly ac
  intensity comparable benefits can be a
  75 minutes of vigorous intensity activi
  the week or combinations of modera
  activity.



CMO, Start Active Stay Active, 2011

Older Adults – Sedentary, Strength and Balance

All Older adults should minimise the amount of time spent being sedentary (sitting) for extended periods.

- Older adults should **also** undertake physical activity to **improve muscle strength** on at least two days a week.
- Older adults at risk of falls should incorporate physical activity to **improve balance and co-ordination** on at least two days a week.

CMO, Start Active Stay Active, 2011

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?

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

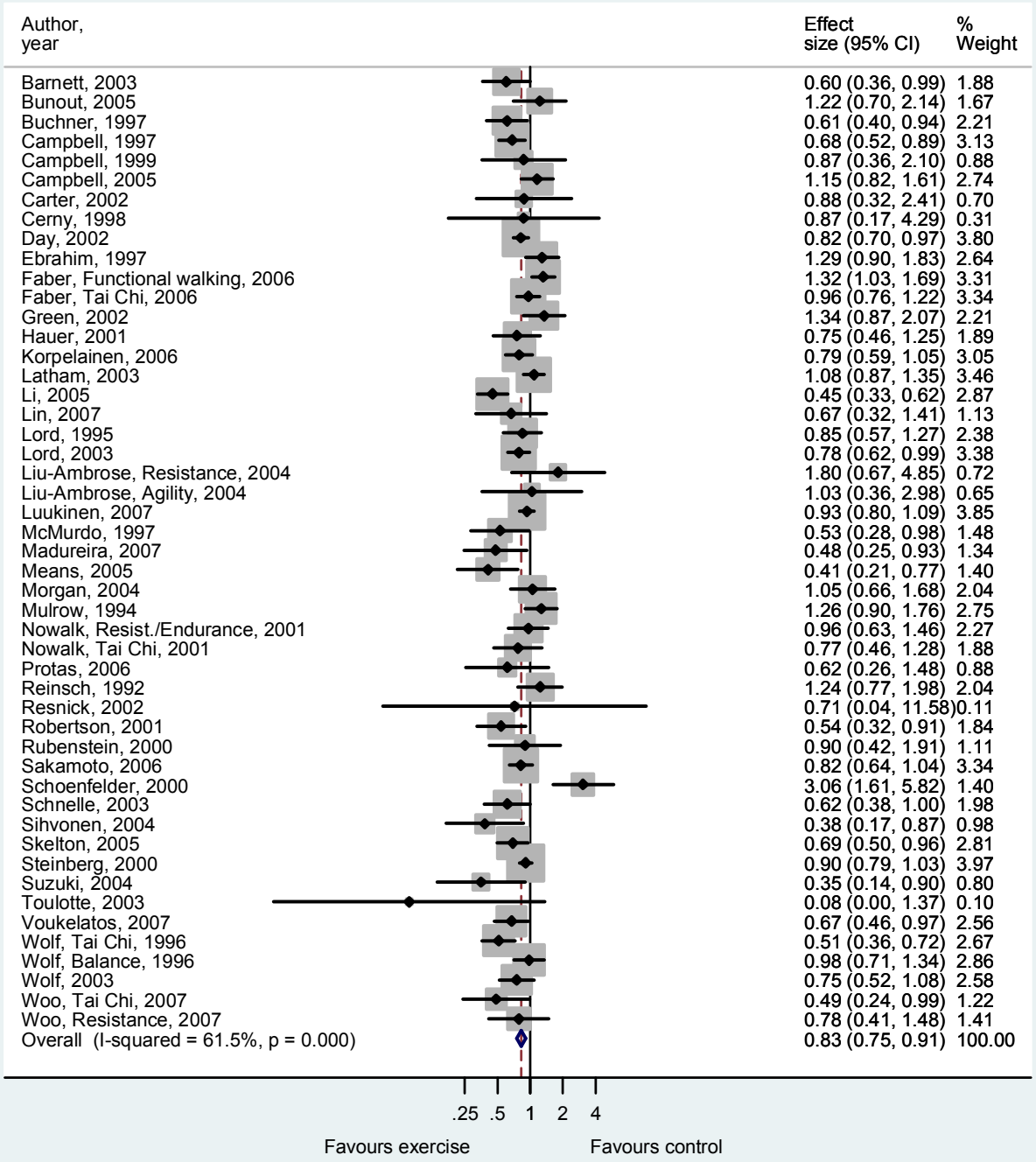
Effective exercise for the prevention of falls – a systematic review and meta-analysis

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



Results

RR = 0.83

95%CI 0.75-0.91

P<0.001

17% reduction in falls

I^2 = 62% moderate heterogeneity

Sherrington et al., JAGS 2008

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

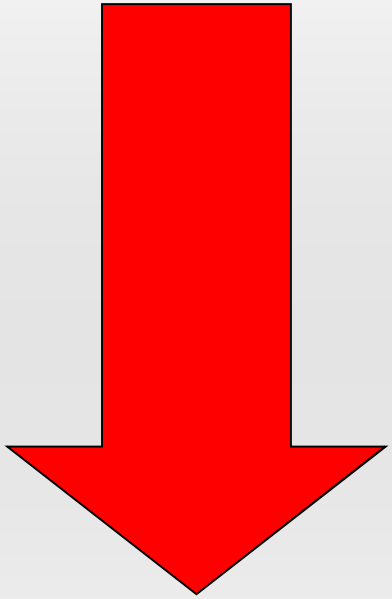
24%

(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

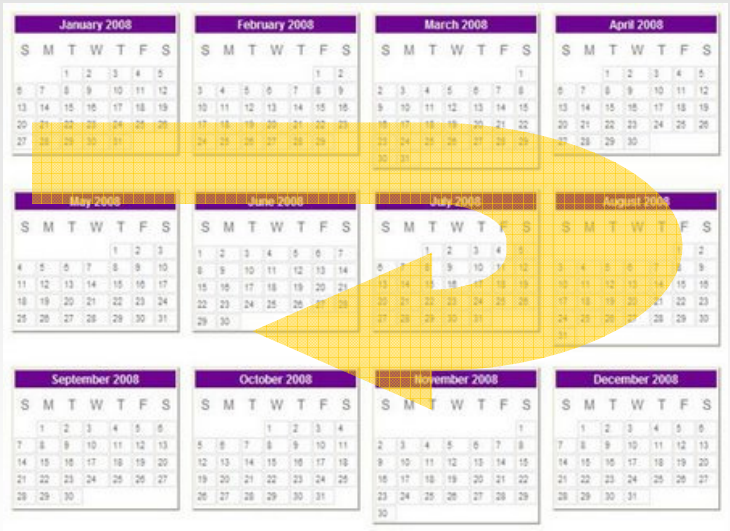
High Dose



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

Does exercise work for all?

- Did any exercise programmes increase risk??

Action gran drops in

Thrill-seeker Barbara, 78, completes 10,000ft skydive

AS a seasoned thrill-seeker who has tried everything from white water rafting to bungee jumping, Barbara Riddle naturally leapt at the chance to go skydiving.

The 10,000ft jump seemed an ideal way to round off an adventure-packed year of jet-skiing, volcano-climbing and paragliding.

But best of all, it would give the 78-year-old Scot yet another

'Age should not be a barrier'

exciting story to tell her 20 great-grandchildren.

Mrs Riddle, of Knock, Aberdeenshire, yesterday described the sensation of falling through the air as 'fantastic'.

The pensioner, whose jump raised £400 for charity the Royal National Institute for the Deaf, said: 'I love having a go at all kinds of so-called terrifying experiences.

'Age shouldn't be a barrier to enjoying physical challenges and it was fantastic experiencing the sensation of flying like a bird.'

Mrs Riddle carried out the tandem jump with her instructor

By Gavin Madeley

Steve Lambert over St Andrews, in Fife.

She volunteered after hearing an RNID appeal for fundraisers to take part in a series of skydives across the UK.

The pensioner sailed through a medical and a two-hour training programme before being cleared for take-off last weekend.

She said: 'It was just such a thrill to be so high up, hurtling through the air. I hope my example will encourage other people – no matter how old – to sign up to help RNID and enjoy this thrilling sport.

'I encourage everyone to think about what they can do in life and urge anyone looking for a fantastic, breathtaking experience to give skydiving a go and raise some money for a good cause.'

Caroline Jupe, RNID events and community fundraising executive, said: 'Barbara's positive attitude is an inspiration to people of all ages. She is the oldest person to have completed one of our skydives.'

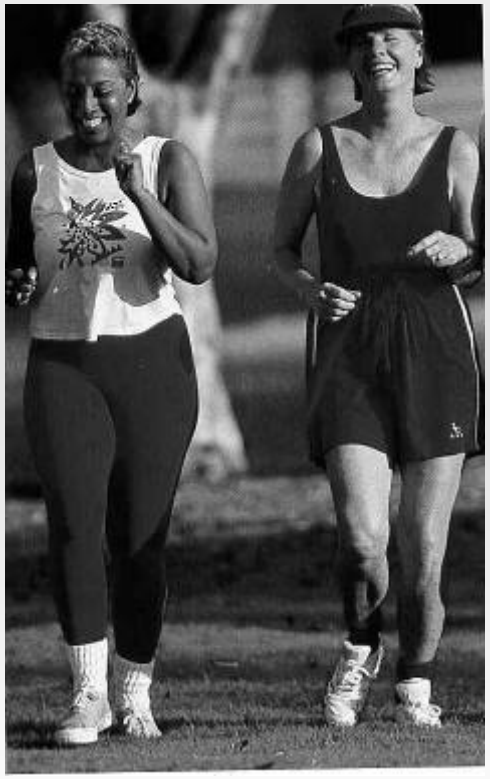
While Barbara may be the oldest person to skydive with the RNID, she is a long way short of being the world's oldest skydiver.

That honour goes to Australian Frank Moody, who was 101 when he jumped in 2004.

Head for heights: Great-grandmother Barbara Riddle and instructor Steve Lambert after their tandem jump

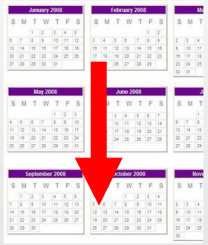
Brisk walking !!

- 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

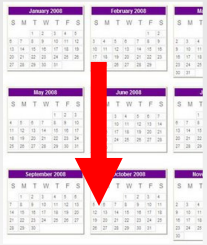


No reduction:
RR 0.95 (0.78 to 1.16)

High balance
Low dose
Walking

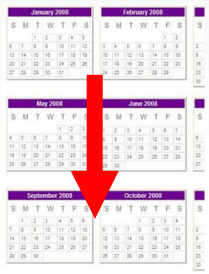
No reduction:
RR 0.96 (0.80 to 1.16)

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)

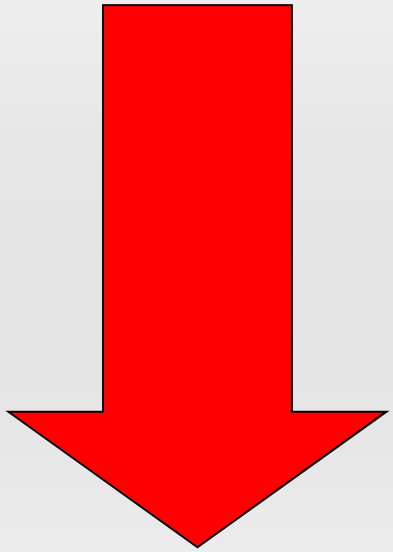
Low balance
Low dose
Walking

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

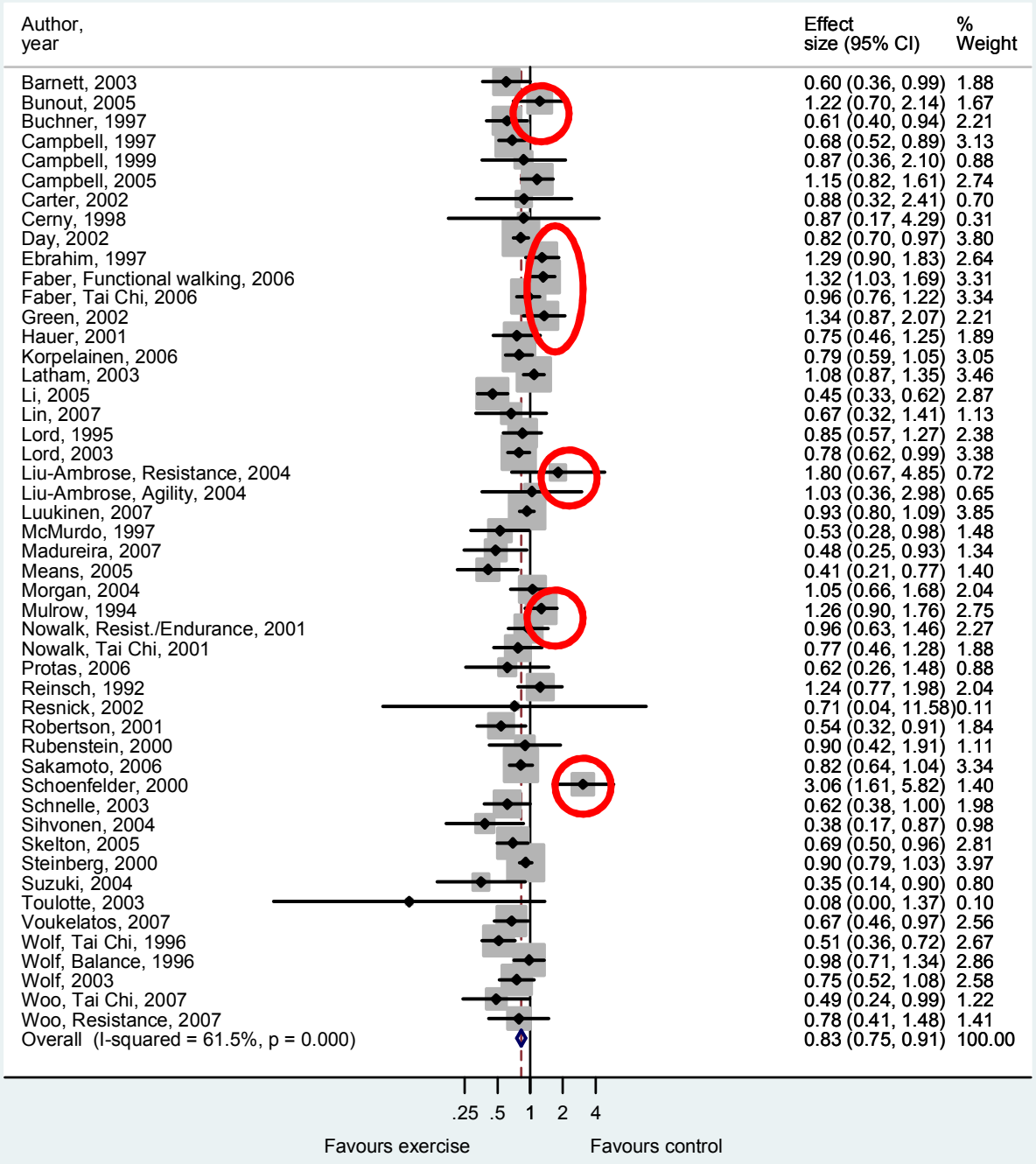


38%

(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



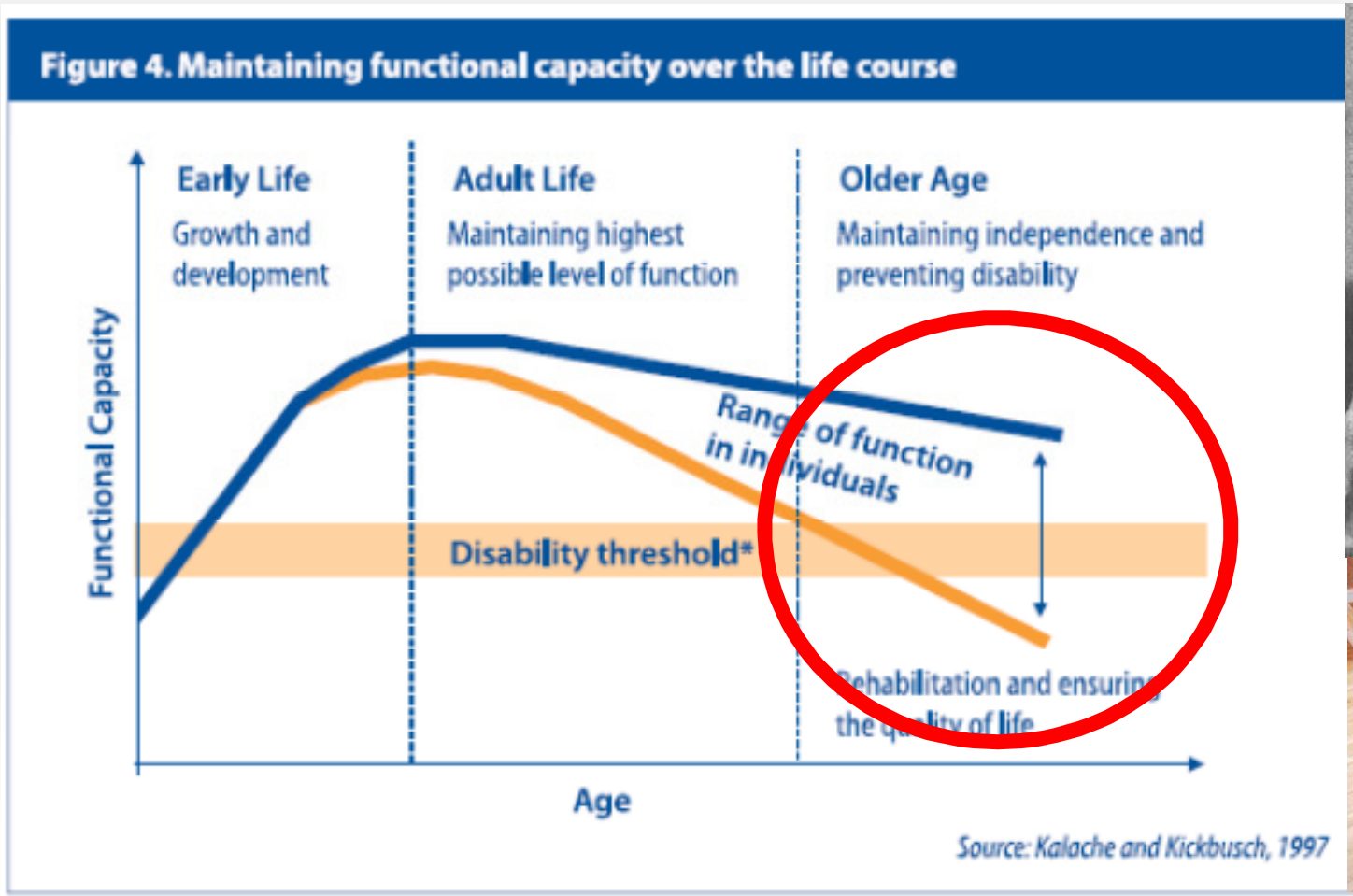
Hidden perils

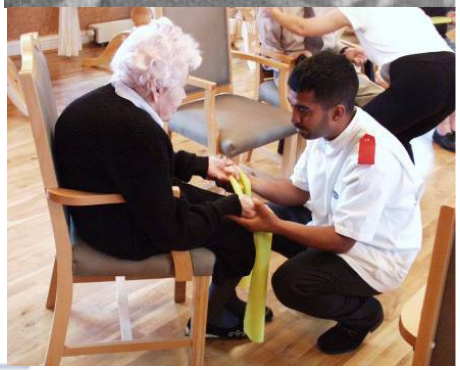
Apart from brisk walking…..

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





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

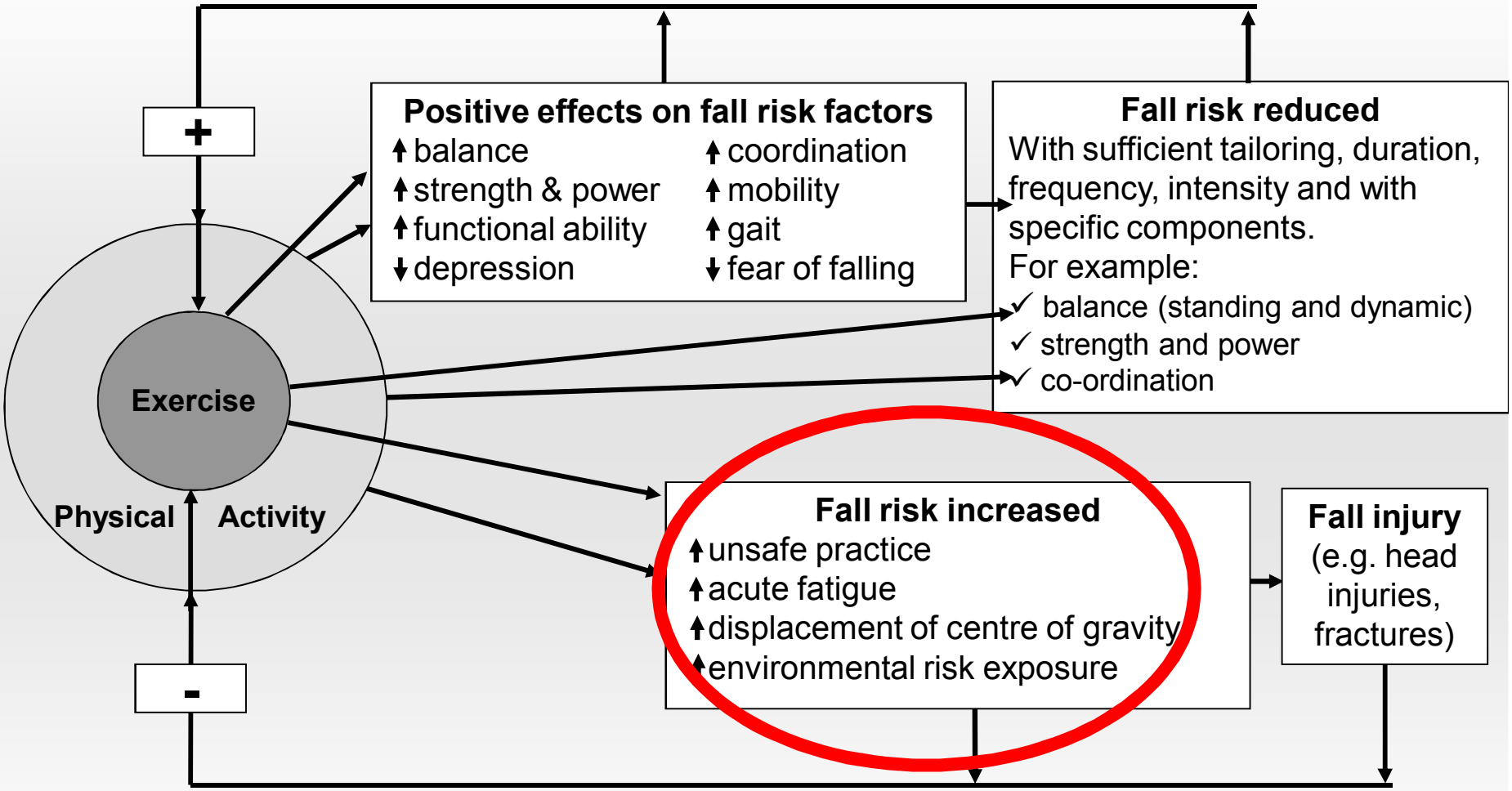
(ACSM 1995, Dinan 2001, Quittian M 1994, Mead G 2005, ACSM 2009, Rimmer J 2005, BACR 2007)

Potential Dangers of Exercise

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

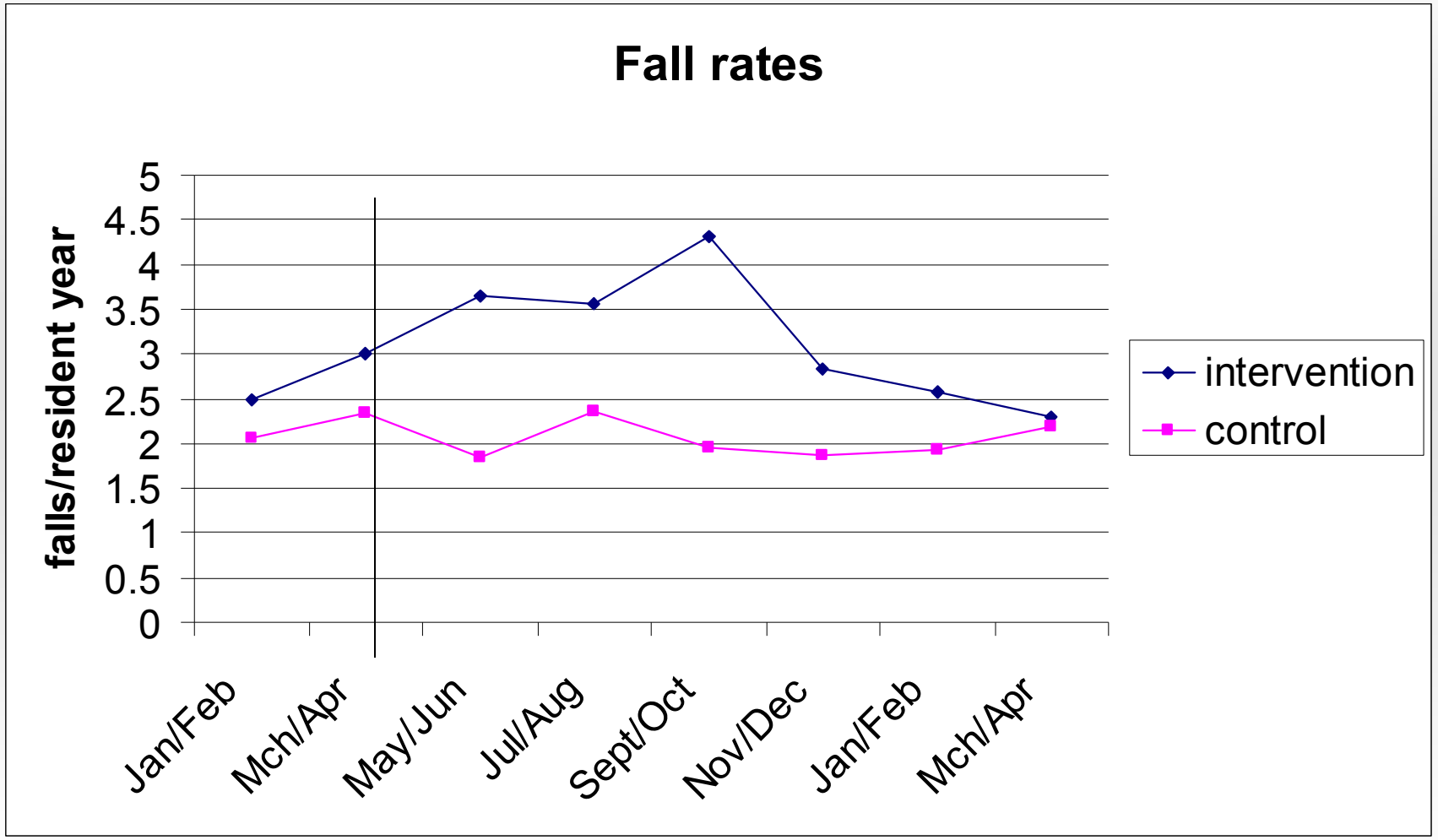
Sinaki & Mickelson 1982

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?

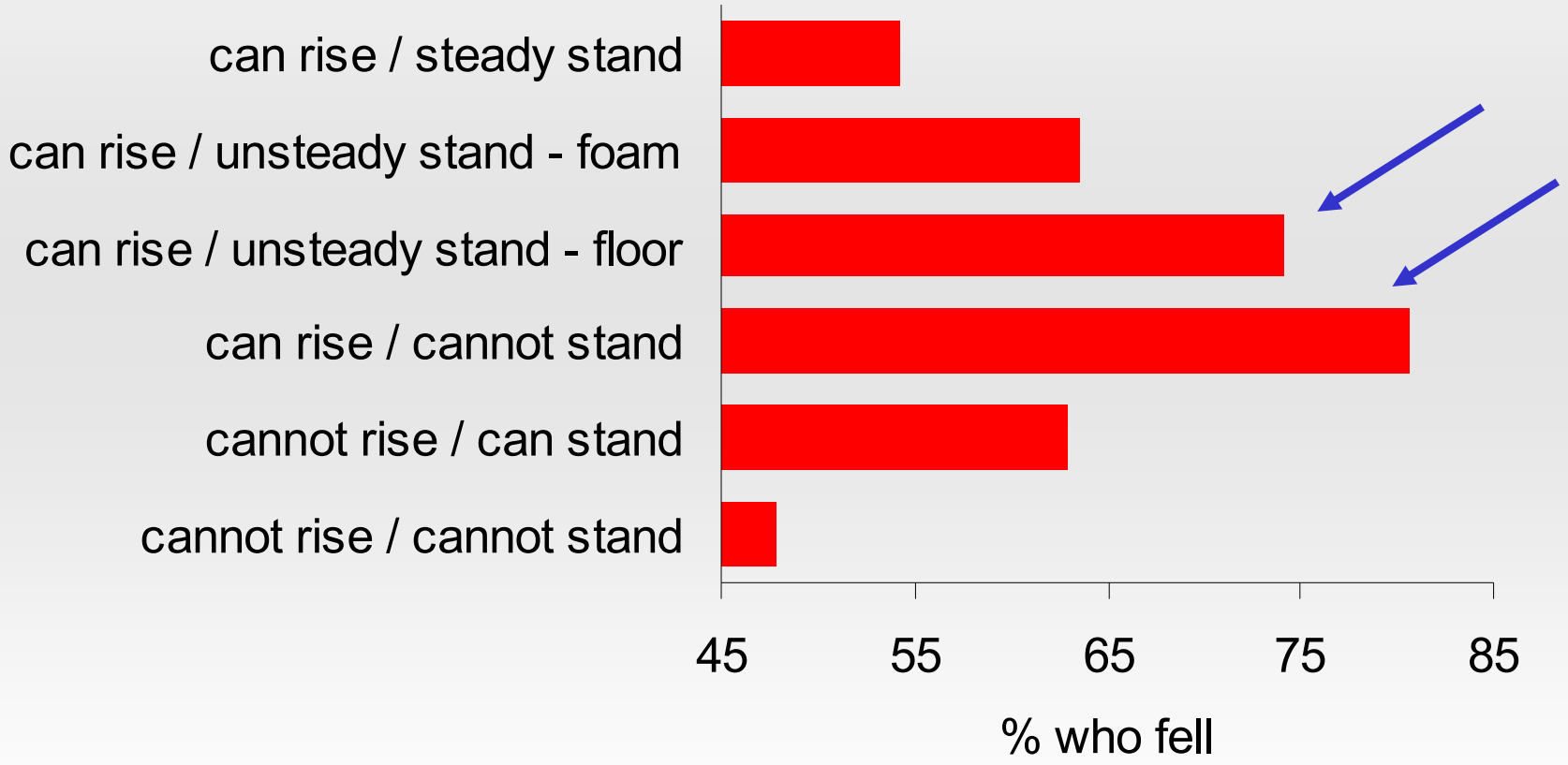
- Frailty index applied to participants in an exercise programme.
  - Those considered frail had RR 2.95 (95% CI 1.64 to 5.32 for a fall compared to those considered pre-frail who decreased risk of falls RR 0.39 (95% CI 0.18 to 0.88)

    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

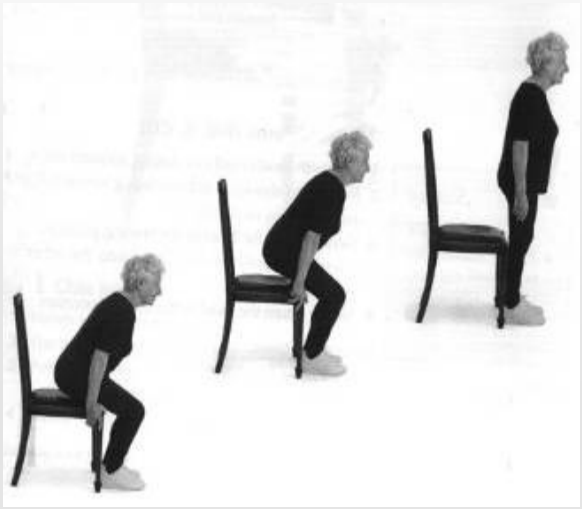
- **Tailoring =** the highly individual prescriptive solutions(adjustments/exclusions/additions) that are required to tailor the adapted exercise intervention to each participants health, functional, psychosocial/ emotional needs

Dinan 2001, 2007

TARGETED RESISTANCE TRAINING

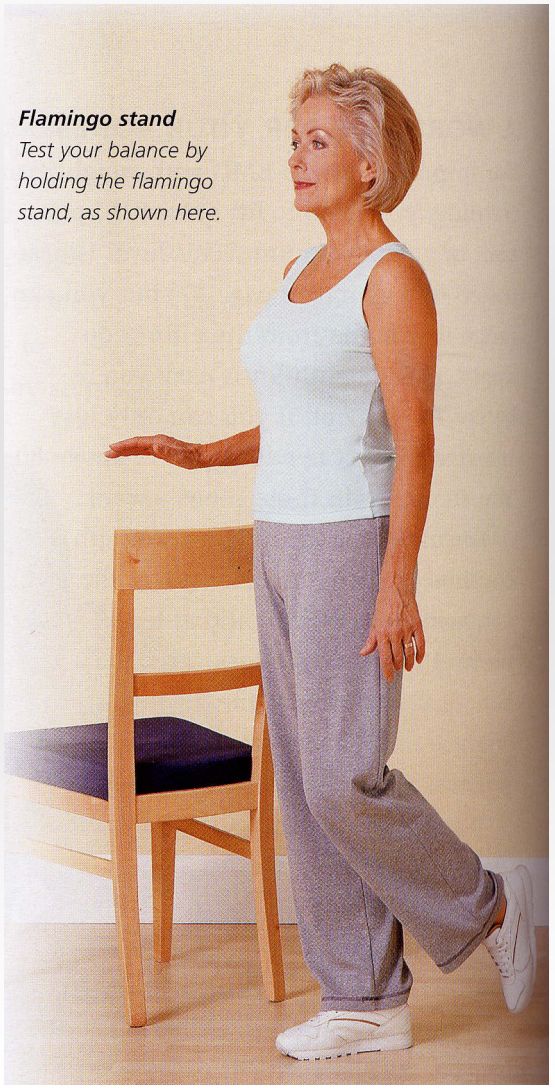
Weights, bands and body weight including targeted bone loading

- **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

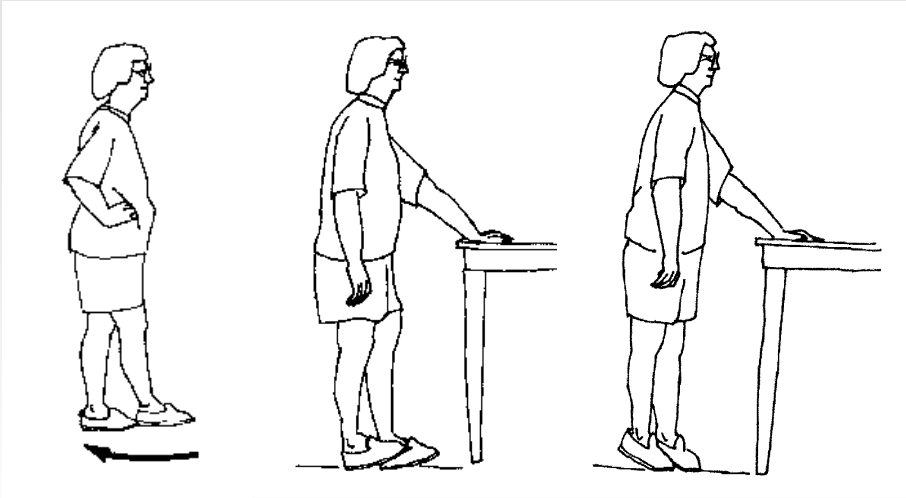
4 weeks 3 x p/w (5-20mins)

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

DYNAMIC BALANCE TRAINING



DYNAMIC BALANCE TRAINING

DYNAMIC ENDURANCE TRAINING

- **for balance**
- **for cardiovascular fitness**

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.

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
- Delivere me to 485 people age
- Improved function and balance, walking ability without aids indoors and outdoors – better confidence and improved mood

NO ADVERSE EVENTS!!!

NHS Forth Valley

Stirling Council

CLACKMANNANSHIRE COUNCIL

Qi Quality Improvement

Falkirk Council

So who should NOT exercise?

- Not many!
- A few contraindications but these are very ill people!

- For everyone else, tailor and adapt exercise to suit and ensure progression is inherent but cautious
- Trained professionals in a wide range of settings (in evidence based exercise) is the key……

“Man does not cease to play because he grows old.

Man grows old because he ceases to play”

George Bernard Shaw

Come and join the fun –
Glasgow SECC
Aug 13-17th 2012

www.wcaa2012.com

Supported by NHS Health Scotland and Scottish Government

Should we target high or low risk people?

- Trend towards better effect in low risk but no significant difference seen in high vs low risk groups
- High risk groups may be more cost effective to treat as more falls per person per year prevented
- Low risk groups could be targeted with a population based health promotion approach (greater reach) with the right messages (eg. Not just walking!)

Sherrington et al., JAGS 2008, 2011

High Risk Population

- Exercise reduces risk by 10% (95%CI = 0 to 20%), 39 studies
- But in nursing homes, falls risk reduced by 7% (NS)
- ++ balance, high dose and no walking programme had same trends for effectiveness as community dwelling population
- So recommendation to use same basic principles but to ensure higher supervision and smaller groups

Sherrington, 2011

Uptake and adherence to exercise programmes

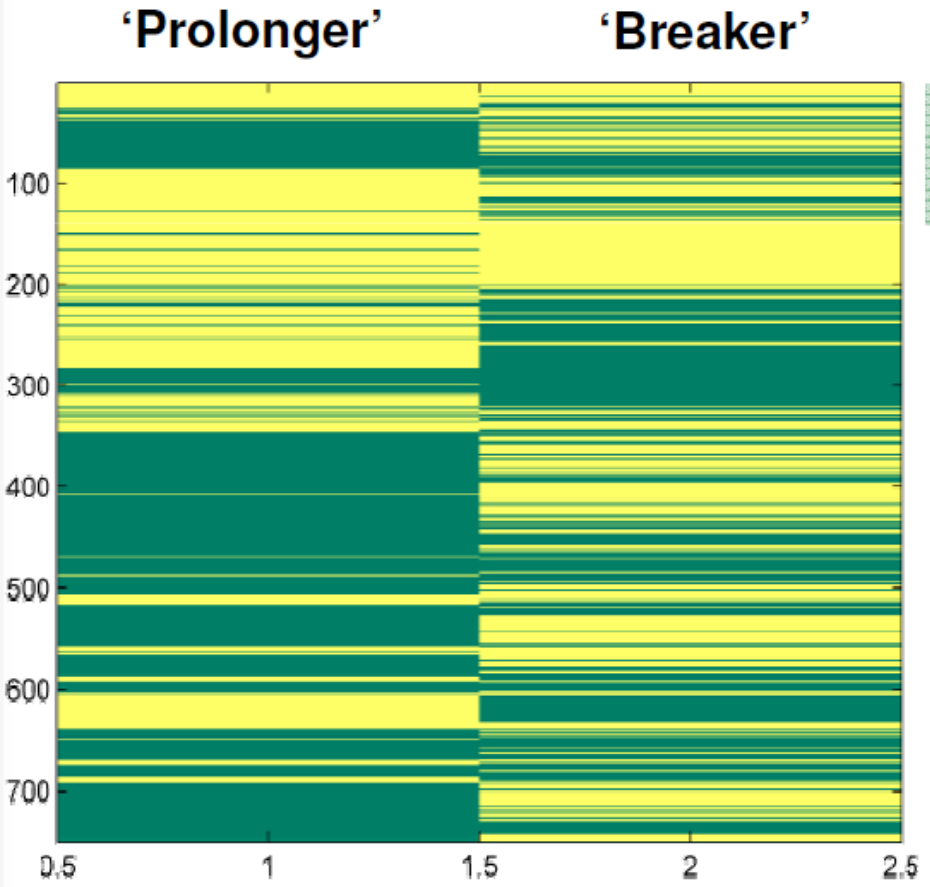
- Uptake and adherence is not high whatever the population
- In Nursing Homes falls prevention programmes
  - Median recruitment rate 48.5%
  - Mean attrition rate at 12 months 10.9% (16.2% with mortality)
- In Nursing Homes exercise programmes
  - Adherence – physical therapy (1:1) 89%
  - Adherence – group exercise 72-88%
  - But when part of a multifactorial intervention – 11%!
- Taking into account recruitment, attrition and adherence, only 1/3 of nursing home residents will adhere to interventions (or is it the staff adhering?)

Nyman & Victor, Age Ageing 2011

Patterns of sedentary behavior are also important

Sedentary
CPM < 100

Not sedentary
CPM 100+



These participants have exactly the same sedentary time

More breaks from sitting time associated with lower average waist circumference, BMI, triglycerides, and 2-hr plasma glucose

Healy et al., *Diabetes Care*, 2008