Exercise – Is it the answer for all older people?

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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

OLDER ADULTS (65 + )

- Older adults should aim to be active daily. Over a week, activity should add up to at least 150 minutes (2 ½ hrs) of moderate intensity activity in bouts of 10 minutes or more - one way to approach this is to do 30 minutes a day, at least 5 days a week.

- For those who are already regularly active at moderate intensity comparable benefits can be achieved through 75 minutes of vigorous intensity activities spread across the week or combinations of moderate and vigorous activity.
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

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

I² = 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

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

24% (95%CI = 0.62 to 0.93)
73 studies

Sherrington, 2011
High Dose

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

23%
(95%CI = 13 to 32%)
30 studies

Sherrington, 2011
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)

No reduction:
RR 0.96 (0.80 to 1.16)

No reduction:
RR 0.91 (0.79 to 1.05)

Increased risk:
RR 1.20 (1.00 to 1.44)
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

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

38%
(95% CI = 27 to 46%) 8 studies

Sherrington, 2011
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

- **Early Life**
  - Growth and development

- **Adult Life**
  - Maintaining highest possible level of function

- **Older Age**
  - Maintaining independence and preventing disability

Source: Kalache and Kickbusch, 1997
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

**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 $>159\text{kg}[350\text{ lb.}])$
- 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

# Potential Dangers of Exercise

<table>
<thead>
<tr>
<th>Type of Exercise</th>
<th>Reoccurrence of Fracture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Back extension</td>
<td>16%</td>
</tr>
<tr>
<td>Flexion (abd. curls)</td>
<td>89%</td>
</tr>
<tr>
<td>Combined</td>
<td>53%</td>
</tr>
<tr>
<td>No exercise</td>
<td>67%</td>
</tr>
</tbody>
</table>

Sinaki & Mickelson 1982
Proposed Conceptual Model

Fall risk reduced
With sufficient tailoring, duration, frequency, intensity and with specific components. For example:
- balance (standing and dynamic)
- strength and power
- coordination
- mobility
- gait
- fear of falling

Fall risk increased
- unsafe practice
- acute fatigue
- displacement of centre of gravity
- environmental risk exposure

Fall injury (e.g. head injuries, fractures)

Positive effects on fall risk factors
- balance
- strength & power
- functional ability
- depression
- coordination
- mobility
- gait
- fear of falling

Physical Activity
Exercise

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 person’s 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

- can rise / steady stand
- can rise / unsteady stand - foam
- can rise / unsteady stand - floor
- can rise / cannot stand
- cannot rise / can stand
- cannot rise / cannot stand

% who fell

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
Unipodal 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

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)


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

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
- Delivering to date over 1,563 sessions
- Delivered to clients from age 65 to 85
- Improved function and balance, walking ability without aids indoors and outdoors – better confidence and improved mood

NO ADVERSE EVENTS!!!
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

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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.

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