Return on Investment – FaME (PSI) and Otago: Cost Effective Interventions for Falls

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Declarations of Interest

- Director of Later Life Training Ltd. A Not for profit organisation that runs falls prevention exercise training in the UK, Europe and Singapore for health and fitness professionals.
- Member of Public Health England's Health Economics commissioning Framework: Falls Prevention Steering Group and National Falls Prevention Coordination Group.
- Chair of Older People Panel for update of the CMO Physical Activity Guidelines for Health.
- Member of Expert Panel on 'Strength and Balance for Health Evidence Review' – Public Health England and Centre for Ageing Better.
- Chair of the National Osteoporosis Society Working Group on Exercise and Bone Health.

Summary of Session

- Why we need to prevent falls and policy drivers
- Exercise to prevent falls
- What is cost effectiveness and Return on Investment (RoI)?
- Cost effectiveness and RoI of FaME and OEP
- Wider benefits of FaME and OEP above preventing falls
- Importance of fidelity to the original interventions
- Overview of the FaME and OEP Structured Exercise Falls Prevention Interventions
- Key elements of effectiveness
- When things go wrong - Implications for cutting corners / cherry picking
- Up coming research and useful resources
- Summary

Falls: Impact

- Causes pain, distress, injury, lost confidence/independence
- Long lies lead to death without injury from fall
- 10.5% all ambulance call outs were falls related
- Most fractures in older people follow a fall: 10% falls result in fracture
- 1 in 2 women, 1 in 5 men in UK will suffer fracture after age 50
- Over 65s suffer greater number of fatal falls
  - Only 33% went home without assistance
  - 1 year mortality, 33% for all admissions
  - Those discharged to nursing care 3x risk of death in first year
- Falls are a symptom of frailty
- More people living longer with multiple conditions and syndromes of ageing

NICE CG161 Falls; Ayoung-Chee et al (2014) J Trauma & Acute Care Surgery: 76 (2) 498-503

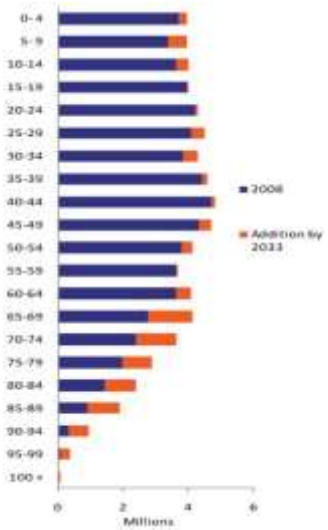
Fear of Falling

- Fear and lack of confidence in balance predict
  - Deterioration in physical functioning
  - Decreases in physical activity, indoor and outdoor
  - Increase in fractures
  - Admission to Institutional Care

"It's the fear that restricts me. In my mind I know that I can't [walk outside]. The fear of falling and not having the strength to go out, that stops me from going out…"
(Female, 60yrs)

(Arfken 1994, Vellas 1997, Cumming 2000, Horne 2011)

UK demographics 2008-30



- Increasing number of people aged over 65:

2010	4.5m people	(1 in 6)
2030	10 m	
2050	19 m	(1 in 4)

- Department of Health estimates a person >85 years is three times more expensive to care for than a person 65-75 years, last year of life is most expensive for health and social care

With thanks to Elaine Rashbrook, PHE Productive Healthy Ageing Meeting Jan 2018

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Risk Factors for Falls

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	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.

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Effective falls prevention

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- Update of 2009 review
- 159 trials with 79,193 participants
- most common interventions tested
  - exercise as a single intervention (59 trials)
  - Multi-factorial programmes (40 trials)

THE COCHRANE COLLABORATION®

Meta-analysis of 6 exercise trials with fractures as outcome
66% reduction in fractures!

Conclusions:

- Group and home-based exercise programmes
  - Strength & Balance
  - Tai Chi
- Home safety interventions
- Multi-factorial assessment and intervention programmes

Gillespie et al. Cochrane Library 2012

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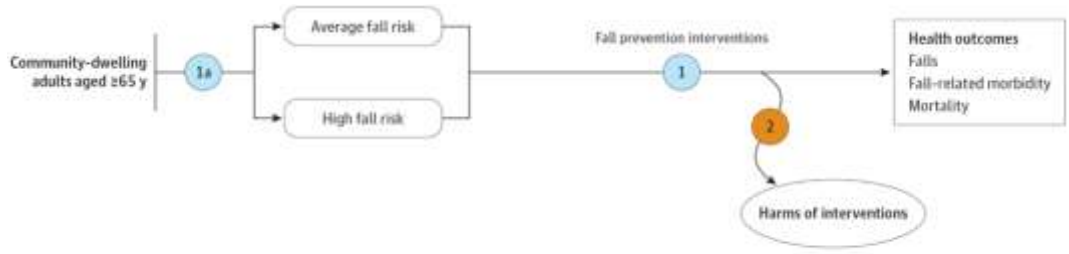
Interventions to Prevent Falls in Older AdultsUpdated Evidence Report and Systematic Review for the US Preventive Services Task Force JAMA. Published online April 17, 2018. doi:10.1001/jama.2017.21962

The JAMA Network



Key questions

1. Is there direct evidence that primary care interventions to prevent falls in community-dwelling older adults at average or high risk for falls, used alone or in combination, reduce falls or falls-related injury, improve quality of life, reduce disability, or reduce mortality?

1a. How is high risk assessed in the included trials?

2. What are the harms associated with primary care interventions to prevent falls in community-dwelling older adults?

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US Preventive Services Task Force | Evidence Report ONLINE FIRST FREE

April 17, 2018

Interventions to Prevent Falls in Older Adults

Updated Evidence Report and Systematic Review for the US Preventive Services Task Force

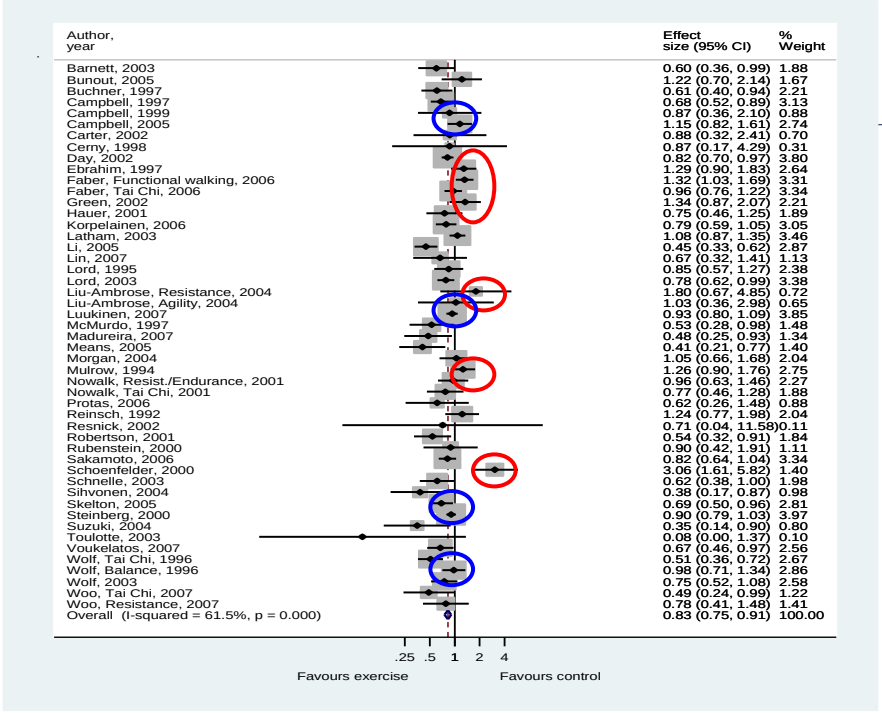
2018 review including 62 RCTs (n=35058 people)

Multifactorial assessment and interventions:
Reduction in falls (incidence rate ratio [IRR], 0.79 [95% CI, 0.68-0.91])
No reduction in other fall-related morbidity and mortality outcomes.

Exercise Interventions:
Significant reductions in people experiencing a fall (relative risk, 0.89 [95% 13 CI, 0.81-0.97]) and injurious falls (IRR, 0.81 [95% CI, 0.73-0.90]) and with a statistically nonsignificant reduction in falls (IRR, 0.87 [95% CI, 0.75-1.00]) but showed no association with mortality. Few considered fractures.

Vitamin D Interventions:
Mixed results but high dose potentially increases fall-related outcomes.

Harms:
Harms of multifactorial and exercise trials were rarely reported but generally included minor musculoskeletal injuries.



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Hidden perils

Ineffective dose / balance challenge

Sherrington et al., JAGS 2008, 2011, BJSM 2017

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What makes the difference for exercise to work?

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- Greatest effects of exercise on fall rates (39% reduction) from interventions including:
  - **Highly challenging balance training (>3 hrs per week)**
  - **High dose (50+ hours)**
  - **Progressive strength training**
  - **Avoiding brisk walking**
- These types of exercise also reduce fear of falling
- **COMMUNITY DWELLING OLDER PEOPLE**

Sherrington et al., JAGS 2008, NSWPHB 2011, BJSM 2017
Kendrick Cochrane Review FoF 2014
Cameron et al. Cochrane Review 2012

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Falls and Bone Health: Linked

- 1 in 2 women, 1 in 5 men in UK will suffer fracture after age 50
- Most fractures in older people follow a fall: 10% falls result in fracture

- Fallers should be screened for osteoporosis.
- People diagnosed with osteoporosis should be assessed for falls risk.
- Osteoporosis Clinic
  - 4 out of 10 of those screened reported fell in last year
  - Half had 2 or more falls
  - Half had lower extremity strength impairment or balance difficulty
  - 4 out of 10 were below normal for their age on performance tests
- Falls Clinic
  - Over three quarters had low bone density or osteoporosis

Ritchey et al. Arch Osteoporos 2017
McCarthy, Skelton et al. BGS Falls Conf 2009

Falls and Fragility pathways

Public Health England | National Osteoporosis Society | NHS RightCare

https://www.england.nhs.uk/rightcare/products/pathways/falls-and-fragility-fractures-pathway/

RightCare Pathway: Falls and Fragility Fractures

RightCare Pathways provide a national case for change and a set of resources to support Local Health Economies to concentrate their improvement efforts where there is greatest opportunity to address variation and improve population health.

Commissioners responsible for **Falls and Fragility Fractures** for their population shou

- ✓ focus on the three **priorities for optimisation**
  - **Falls prevention**
  - **Detecting and Managing Osteoporosis**
  - **Optimal support after a fragility fracture**
- ✓ work across the system to ensure that schemes to deliver the **higher value interve** are in place
  - Targeted **case-finding** for osteoporosis, frailty and falls risk
  - **Strength and balance training** for those at low to moderate risk of falls
  - **Multi-factorial intervention** for those at higher risk of falls
  - **Fracture liaison service** for those who have had a fragility fracture,
- ✓ use the Falls Prevention Consensus Statement and Resource Pack, especially the **implementation checklist** – there are links to the relevant sections throughout this resource

£59m could be saved on emergency admissions due to falls for those 65 years and over if CCGs achieved the rate of the lowest 5 of their peers

£37m could be saved on hospital admissions for hip and thigh injuries if CCGs achieved the rate of the lowest five of their peers.

Falls and Fragility Fractures

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National Opportunities	1/3 of over 65s fall at least once each year and 255,000 result in an emergency admission	80% of those who had a non-hip fracture weren't offered strength and balance exercises	There are around 500,000 fractures per year but less than 1/3 receive bone protecting treatments	Hip fractures = £1.9 billion in hospital costs and half follow a previous fragility fracture.
Inter-locking Components	Falls prevention	Detecting and managing osteoporosis	Optimal support after a fragility fracture	
Higher value interventions	Cross-cutting: 1. Integrated, multi-agency approach and joint workforce education 2. Focus on environments: high risk care settings and healthy homes 3. Personalised care and support planning, shared decision making			
	Targeted case-finding for falls risk and osteoporosis	Strength and balance training for low to moderate falls risk	Multi-factorial intervention for higher falls risk	Fracture Liaison Service including follow-up at 4 and 12 months
	Life course approach to lifestyle risk factors			
The Outcomes	Reduced number of falls	Reduced admissions due to falls	Reduced number of fractures	Reduced emergency admissions
The Evidence	22% of fire and rescue home visits result in falls assessment	Strength and balance training reduces risk of first or further falls	Risk assessment and falls prevention (multifactorial) reduces falls by 24%	Effective case-finding and appropriate drug treatment reduces fracture risk by 50%

NHS RightCare's essentials of population healthcare

Priorities for Optimal Prevention and Management across a system

https://www.england.nhs.uk/rightcare/products/pathways/falls-and-fragility-fractures-pathway/

NHS RightCare

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Falls Prevention and Management in Scotland

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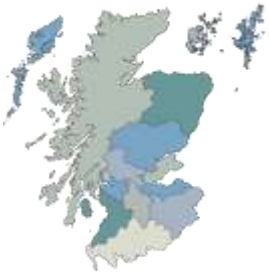

2008
CHP Falls Leads' Network

Leadership, learning, peer support and sharing.

2010
Up and About. Pathways for the Prevention and Management of Falls and Fragility Fractures.

All the aspects of falls prevention, falls management and fragility fracture prevention placed in the context of a person's journey of support and care.

http://www.knowledge.scot.nhs.uk/fallsandbonehealth.aspx

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And in Wales…

Prudent Healthcare Falls Prevention Programme

The 1000 Lives Improvement Falls Prevention programme for Older People aims to help older people to maintain their health and wellbeing, live longer in their own homes and remain active in their communities.

Overview

Falls prevention is a key issue in the improvement of health and wellbeing amongst older people as falls are a major cause of disability and death in older people in Wales. It is estimated that between 230,000 and 460,000 people over the age of 60yrs of age fall in Wales each year. Too often these falls blight the lives of older people, resulting in serious injury which can lead to loss of confidence, loneliness and isolation.

Action Areas for the Prudent Healthcare Falls Prevention Programme:

- http://www.1000livesplus.wales.nhs.uk/falls

Supporting Quality of Care for Older People

- Global health standard set of outcome measures in older people to enable healthcare systems to improve the quality of care for older people
- Otago and FaME should help support multiple outcomes:
  - Falls
  - Frailty
  - Activities of Daily Living
  - Loneliness and Isolation
  - Mood and Emotional Health
  - Participation and Decision Making

Akpan et al. BMC Geriatrics (2018) 18:36

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PA at 65 predicts falls at 90

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- 1596 retirement community residents
  - Current age = mean 94 years
  - Self reported PA in 1980s, self reported falls now
  - 52% fallers, 32% recurrent fallers
- Risk of falls and recurrent falls **35-40% lower** in those reporting **30+ minutes** of moderate intensity physical activity per day compared to those doing less
- So we need to encourage people to meet PA Guidelines for health!

PHYSICAL ACTIVITY = PRIMARY PREVENTION

Paganini-Hill et al. Age Ageing 2017

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Are we meeting the guidelines?

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- A third of men and a quarter of women meet the muscle strengthening guideline
  - half that of published figures for aerobic physical activity.
- Only 1 in 5 older men and 1 in 8 older women met the balance & co-ordination guidelines

Chatterjee BJGP 2017

Strain et al. BMC Public Health 2016

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PHE Falls and Fractures Consensus Statement

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- https://www.gov.uk/government/publications/falls-and-fractures-consensus-statement

Falls and fracture consensus statement: supporting commissioning for prevention

Ref: PHE publications gateway number: 2016588
PDF, 890KB, 22 pages

This file may not be suitable for users of assistive technology. Request an accessible format.

Falls and fracture consensus statement: resource pack

Ref: PHE publications gateway number 2017193
PDF, 417KB, 34 pages

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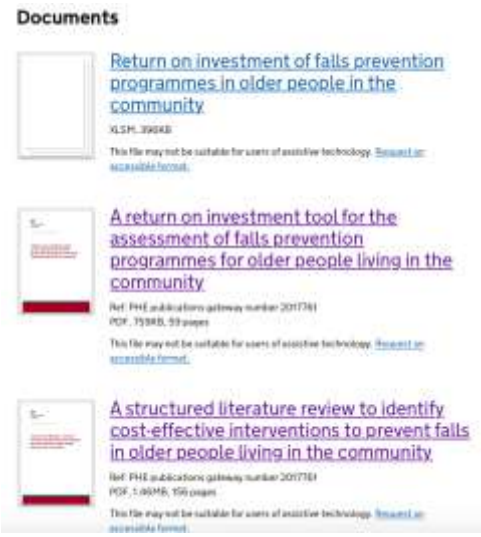
FaME (PSI) and OEP named effective interventions

PHE Cost-effective Commissioning for Falls Prevention



https://www.gov.uk/government/publications/falls-prevention-cost-effective-commissioning

the total costs to implement and sustain each intervention for *up to 2 years* was calculated and data from relevant clinical trials used to estimate the total number of falls in this time period should each intervention be implemented **with fidelity**, in a pre-defined population.

What is cost-effectiveness?

- Three main types of economic evaluations used to determine value for money when comparing falls prevention interventions with usual care or when comparing at least two different interventions
- The common feature of all these analyses is the comparison of monetary units between competing alternative interventions
  - cost-effectiveness analysis

$$ICER = \frac{\Delta Cost}{\Delta Effect}$$

    - benefits are measured using a clinically relevant outcome such as life years gained or number of falls prevented
    - incremental cost-effectiveness ratio (ICER) = the ratio ΔC: ΔE, where ΔC (incremental cost) was the change in resource use resulting from the exercise programme, ΔE (incremental effect) as the difference between the number of falls and the number of falls resulting in moderate or serious injury in the two groups.
  - cost–utility analysis
    - health benefits are measured by a quality adjusted life year (QALY). Most interventions with older people do not change quality of life markedly and older people have lower QALYs as they have less years left to calculate QALYs with.
  - cost–benefit analysis
    - benefits and costs are expressed in monetary terms, and expressed as net present value.

What is return on investment?

- **Return on Investment (ROI)** is the ratio between the net profit and cost of investment resulting from an investment of some resource.
- A high ROI means the investment's gains compare favorably to its cost. As a performance measure, ROI is used to evaluate the efficiency of an investment or to compare the efficiencies of several different investments.
- In purely economic terms, it is one way of relating profits to capital invested.
- **Net monetary benefit** = represents the value of an intervention in monetary terms when a willingness-to-pay threshold for a unit of benefit (for example cost of falls) is known.
- **Quality-adjusted life year (QALY)** = a summary outcome measure used to quantify the effectiveness of a particular intervention. QALYs have been designed to combine the impact of gains in quality of life and in quantity of life (ie life expectancy). Overall, a reduction in falls results in higher QALY scores across the population.
- **Financial ROI** = Cost savings calculated
- **Societal ROI** = Cost savings plus QALY gains calculated

PHE, ROI, 2017

PHE Return on Investment Tool

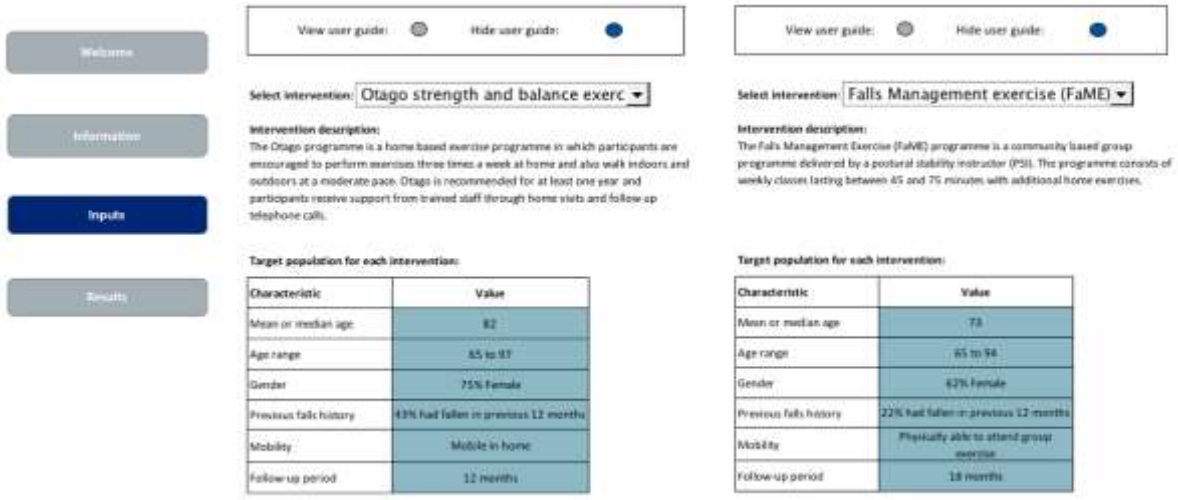
- Developed by York Health Economics Consortium
- Aim: Aid decision making and increase the uptake of cost-effective programmes
- Covers OEP, FaME, Tai Chi and Home Assessment and Modification
- Can insert local area data for specificity (eg. population size by geographical area staff costs, venue hire, travel)
- In built user guide
- Read information section first!

https://www.gov.uk/government/publications/falls-prevention-cost-effective-commissioning

PHE Return on Investment Tool

- Inputs:
  - Intervention (only one intervention at a time)
  - Population (size, geographical area choices or type in specific to your area)
    - includes percentage willing to take up intervention and proportion of population at risk of future falls)
  - Intervention costs (set by experts, but you can alter staff costs and other parameters)
    - includes costs of training staff, equipment and provision of transport
    - equipment costs have been set to allow effective progression of strength
    - can choose to add costs for local evaluation of intervention (5% of total prog. costs)
  - Other resources (costs of and rates of falls in your population – default data)
    - can change costs of GP visits, A & E visits, admissions if have local data
  - Effectiveness (based on published figures for the interventions but you can change figures if you know you will be delivering a less effective programme)
  - Utility (based on quality of life utility scores and should not be changed unless you have local data)

PHE Return on Investment Tool



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It is important to note that the generalisability of the results of this analysis will depend on the similarity of the population group receiving an intervention to that of the participants enrolled in the clinical trials (eg in terms of age range and history of falls). Similarly, each intervention should be delivered with fidelity to best practice protocols (eg delivered by trained professionals with sufficient equipment). If the quality of the delivered interventions is consummately lower than those delivered as part of the underlying clinical trials then the reduction in the number of falls is expected to be lower in clinical practice, which would reduce the financial and societal returns (as illustrated by the results of the sensitivity analysis).

Intervention	Financial ROI	Societal ROI
Otago	£0.95 : £1.00	£2.20 : £1.00
FaME group exercise	£0.99 : £1.00	£2.28 : £1.00
Tai Chi	£0.85 : £1.00	£1.97 : £1.00
Home assessment and modification	£3.17 : £1.00	£7.34 : £1.00

Comparison to RoI of other interventions

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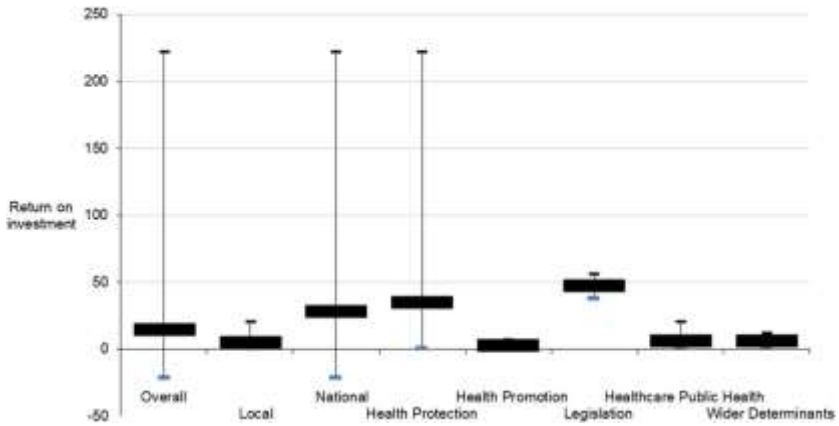

- Health promotion
  - mean RoI 2.2
- Public Health
  - mean RoI 5.1
- National Level
  - mean RoI 27.2
- Legislation
  - mean RoI 46.5

- National Level and Legislative interventions (often one off changes to something)
- Public health and health promotion (more complex, intensive and sustained interventions) yield lower financial returns but are still worth pursuing

Masters, J Epid Comm Health 2017

PHE Cost-effective Commissioning for Falls Prevention

FaME (PSI)

- Cost-effectiveness based on Iliffe et al. paper – primary prevention (low risk older adults)
  - (NB. PHE used average of during and post intervention fall rates)
- Will be more cost-effective in frequent fallers (greater reduction in falls)
- **Net Monetary Benefit** = £283.07 per person
- **Financial ROI**:
  - Overall, financial savings are £0.01 lower than costs for every £1 invested.
- **Societal ROI:**
  - Once QALYs considered – Benefit to cost ratio = £2.28 for every £1 spent.
- **NOT CONSIDERED**: Potential benefits to more people meeting PA guidelines (15 mins per day more MVPA) and self efficacy, long lies, reduced fear of falling.

2. The Falls Management Exercise (FaME) programme is a community based group programme delivered by a postural stability instructor (PSI). The programme consists of weekly classes lasting between 45 and 75 minutes with additional home exercises lasting at least 6 months [13].

PHE Cost-effective Commissioning for Falls Prevention

FaME (PSI)

- Costs to deliver based on:
  - Initial assessment by a PSI (1 hour)
  - 6 months group 1 hr classes (24 hours per cohort)
  - Delivered by PSI
  - 12 hours travel time
  - Staff training
  - Community hall hire
  - Exercise equipment (therabands, floor mats)
  - Home exercise booklet/DVD
  - Evaluation of effectiveness costs

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PHE Cost-effective Commissioning for Falls Prevention

Otago

- Costs based on home supervised Otago, not on group based.
- Group based should be more effective but only if delivered for dose of more than 50 hours!
- **Net Monetary Benefit** = £528.58 per person
- **Financial ROI**:
  - Overall, financial savings are £0.05 lower than costs for every £1 invested.
- **Societal ROI:**
  - Once QALYs considered – Benefit to cost ratio = £2.20 for every £1 spent.
- **NOT CONSIDERED**: Potential benefits to more people meeting PA guidelines and improved executive function

1. The Otago programme is a home based exercise programme in which participants are encouraged to perform exercises 3 times a week at home and also walk indoors and outdoors at a moderate pace. Otago is recommended for at least one year and participants receive support from trained staff through home visits and follow up telephone calls [13].

PHE Cost-effective Commissioning for Falls Prevention

Otago

- Costs to deliver based on:
  - Initial assessment by a physiotherapist or PSI (1 hour)
  - Supervision by trained Otago instructor
  - 10 contact hours made up of:
    - 1 initial visit of 1.5 hour (includes 0.5 hours travel time).
    - 4 follow-up visits of 1.0 (includes 0.5 hours travel time).
    - 9 catch-up call of 0.5 hours each during months with no scheduled home visit (so 4.5 hours per participant).
  - Staff training
  - Adjustable set of ankle weights and home exercise booklet or DVD
  - Evaluation of effectiveness costs

PHE Cost-effective Commissioning for Falls Prevention

Tai Chi

- Based on meta-analysis of multiple studies (from 15-24 weeks) so hard to follow with fidelity!
- Not currently recommended as a clinical falls prevention intervention – primary prevention mainly.
- Costed on average 49 hours of delivery, hall hire, staff training and travel time.

3. Tai Chi or Tai Ji Quan (Tai Chi henceforth) exercises combine deep breathing and relaxation with flowing movements. It can be performed either in a community based group or at home on a regular basis [14].

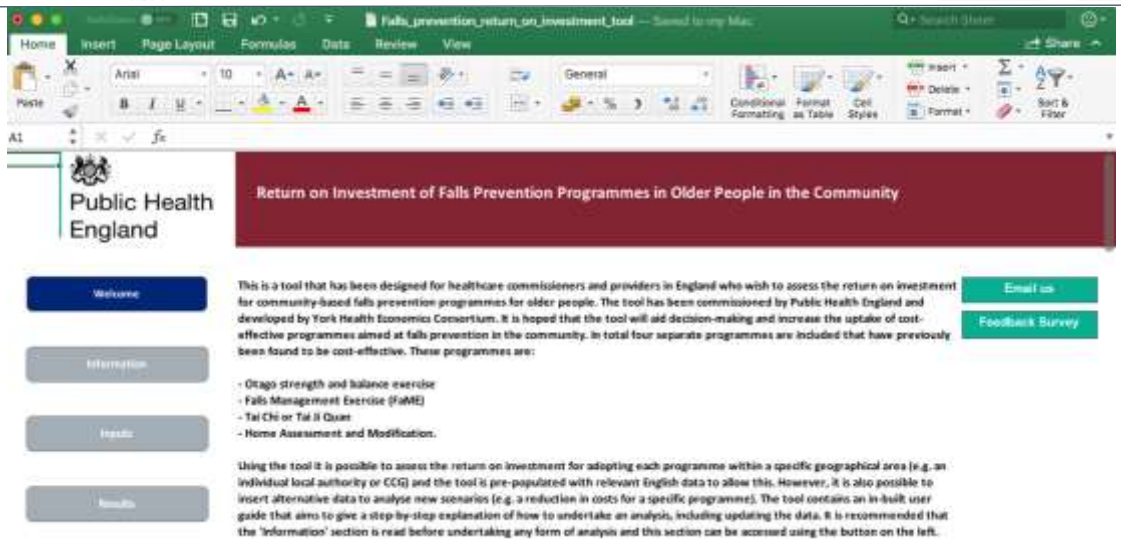
PHE Cost-effective Commissioning for Falls Prevention

Home assessment and modification

- Based on meta-analysis of multiple studies (from 15-24 weeks) so hard to follow with fidelity!
- Should be performed by OTs and only effective in fallers (secondary prevention).
- Costed on OT home assessment visit(s) of 3.1 hours total (including follow up and arranging equipment)

4. Home assessment and modification (HAM) is a service in which relevant professionals risk assess a person's usual residence to identify environmental hazards and carries out actions to reduce these. Typical environmental hazards are loose mats, poor lighting and no handrails [15].

PHE Return on Investment Tool



FaME - different IRR data on falls rate reduction

FaME (PSI)

- Without the evaluation costs added

STILL NOT CONSIDERED: Potential benefits to more people meeting PA guidelines (15 mins per day more MVPA) and self efficacy, long lies, reduced fear of falling.

	FaME (PHE tool IRR 0.825, 0.79 control)	FaME (IRR 0.74-Gawler, 0.88 control)	FaME (IRR 0.46-Skelton, 0.90 control)
Net Monetary Benefit	£293.73	£483.92	£946.98
Financial benefits	£219	£301	£499
Financial ROI	£1.04: £1.00	£1.43: £1.00	£2.37: £1.00
Societal benefits	£504	£694	£1,157
Societal ROI	£2.40: £1.00	£3.30: £1.00	£5.50: £1.00

Previous OEP/FaME cost analyses

OEP

- Aged 75 and older – ICER = The programme cost £523 (at 1998 prices) **per fall prevented** for delivering the programme[1]. £942 (at 2008 prices) per fall prevented
  - **cost benefit ratio** - £81 (delivering intervention and hospital costs averted)[3]
- Aged 80 and older – ICER = The programme cost £441 **per fall prevented** (at 1998 prices) - or £121 **per person to deliver** for one year[2]. £794 (at 2008 prices) per fall prevented No difference in number of hospital admissions so not added to CER models. CERs only calculated for the duration of study – no follow up
  - **cost-benefit ratio** - £0 (delivering intervention and hospital costs averted)[3]
- Aged 65 and older - £88-117 (London, Notts/Derby at 2011 prices) **per person to deliver** for 6 months[4]

FaME

- Aged 65 and older - £269-218 (London, Notts/Derby at 2011 prices) **per person to deliver** for 6 months[4] (allowing for 2 hours per session, average 10 people per group)
- The cost per additional person achieving the target of ≥150 minutes of MVPA at the primary endpoint in the FaME arm was £1920 in London and £1560 in Nottingham (mean £1740)[4]
- For every £1 of public health money invested, the return to the public purse is £50.59[5]

1. Robertson, RCT, BMJ 2001; 2. Robertson, Controlled Trial, BMJ 2001b; 3. Davis, Review, BJSM 2010; 4. Iliffe, RCT, HTA 2014; 5. Gateshead ROI, 2017.

Social RoI: Gateshead Older Peoples Assembly

- http://www.gatesheadopa.org.uk/news/sroi/
- **Their 'Staying Steady' exercise classes are delivered by PSIs based on the FaME programme, for 20 weeks**.
- The Staying Steady classes are supported by public health funds of £19,146 ((approx. £120 per head).
- This provides estimated savings of at least £968,736 compared to the spend on public health without this investment
- For every £1 of public health money invested in Staying Steady classes, the return to the public purse is £50.59
- https://www.youtube.com/watch?v=5MuEO68cLUU&feature=youtu.be (4.45 mins)

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Staying Steady Video

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Benefits of FaME and OEP: Wider than falls prevention

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Otago Exercise Programme Leader

FaME	OEP
Habitual Physical Activity (using PASE and CHAMPS)[1,2]	Habitual Physical Activity (PASE)[7] (control group got less active, OEP same)
Walking Speed (using 6MWT)[1]	Perceived functional performance[8]
Balance (TUG, BBS)[1,4]	Balance (TUG, 1LS, 4 test balance, Tinetti)[7,8,10, 11,12]
Strength (30sCR, Dynamometer)[4]	Strength (30sCR, Dynamometry)[7,8,10,11]
Bone Mineral Density (DEXA)[5]✣	
Quality of Life (SF12)[1]	Quality of Life (SF36)[11]
Fear of falling (FES-I)[1]	Fear of falling (FES-I)[7,] (control group became more fearful),11
Socialisation and participation (qualitative)[1,3]	
Expectations of Exercise (OEE)[2,6]	
Confidence (ConfBal etc)[2,3,4,6]	Confidence (ConfBal)[12]
Risk of death (mortality 3 year3 post)[3]	Risk of death (mortality 12 months post)[9]
Moving into care[3]	
Avoiding long lies (ability to get up off floor)[3]	

FaME Refs: 1. Yeung PHCR&D 2015; 2. Iliffe HTA 2014, BJGP 2015; 3. Skelton, Age Ageing 2005; 4. Gateshead ROI 2017; 5: Skelton JAPA 2008 ✣9 month programme (not seen in 6 month programme, Duckham Age Ageing 2015); 6. Gawler AGG 2016. OEP Refs: 7. Campbell BMJ 1997; 8. Shubert FrontiersPH 2017; 9. Thomas Age Ageing 2010; 10. Benavent-Caballer Physio 2016; 11. Kyrdalen Physio Res Int 2014; 12. Hawley Hague Physio TP 2017

Evaluating effects locally

- Steady Steps Programme, Edinburgh (FaME/PSI)

As part of its commitment to encouraging active ageing, Edinburgh Leisure launched the Steady Steps programme, funded through Edinburgh's Integrated Joint Board, in 2012. The community-based health referral programme, which has supported over 1,000 people since its launch, is designed to support those who have had, or are at risk of having, a fall, with the aim of preventing future falls or injury.

http://www.ukactive.com/stream.asp?stream=true&eid=9333&node=733&checksum=7828DF5A0C894287854E4AA7F147C9DE

Sessions are delivered by a Postural Stability Instructor who specialise in delivering evidence based, effective balance exercise classes; the instructor works closely with each participant to help identify goals and ensure that they exercise in a safe and supported environment. Basic tests and questionnaires are also conducted at the start and end of the programme to help measure the participants' progress.

the Steady Steps programme offers an inclusive and welcoming environment for participants where social interaction is strongly encouraged, which is proven to contribute towards improved mental and general wellbeing.

Claire Craig
Health and Physical Activity Manager, Edinburgh Leisure

89% Improvement in balance confidence

96% Improved in physical function

75% Not experienced a subsequent fall

63% Have remained active post-programme

Are FaME and OEP always effective?

6 months of FaME in sedentary older adults recruited through GPs (22% falls history)

FaME increased moderate to vigorous physical activity by 15 mins/day.
Up to 12 months post intervention. **By 24 months effect discontinued.**

FaME reduced falls by 26% (IRR 0.74)
Up to 12 months post intervention. **By 24 months effect discontinued.**

MVPA increased by 105 mins per week

OTAGO home based exercise arm – no change in falls (unless adhered to >75% prescription) AND no change in physical activity.
? NOT
challenging enough for this population
sufficiently progressed or supported
A sufficient duration/dose
replicated with fidelity to original!

FaME was more expensive than OEP (£269 versus £88 per participant in London; £218 versus £117 in Notts/ Derby at 2011 prices). The mean cost per additional person achieving the target of ≥150 minutes of MVPA was £1740)

Iliffe S et al. Health Technology Assessment 2014; 18(49):vii-xxvii, 1-105; Iliffe et al. BJGP 2015; 65(640):e731-8; Gawler et al. Arch Gerontol Geriatr. 2016;67:46-54.

Fidelity

- Exercise is one of the most frequently prescribed therapies in both health and disease
- As with any other 'medicine' – DOSAGE (volume and intensity), FREQUENCY of administration (sessions per week), TYPE (components of physical fitness), SYSTEMIC and PSYCHOACTIVE effects, CONTRAINDICATIONS and SIDE EFFECTS all have to be taken into account to achieve the BEST CLINICAL OUTCOME
- Should start with a MINIMUM EFFECTIVE DOSE and titrate upwards (progress!)

Treat Exercise as you would a 'drug'

Fidelity

- For Medicines there is a strict approval process and strict guidelines on who can prescribe and for how long, what dose etc.
- Yet for exercise, it seems anyone can deliver it, to anyone, for any length of time and any dose?
- For effective outcomes in frailty we have to have FAST OUTCOMES to change prognosis! We need to use EBP programmes, trained deliverers who can tailor to suit ability and need and an effective dose!

Medicines & Healthcare products Regulatory Agency

Failing the Frail: A Chaotic Approach to Commissioning Healthcare Services for Care Homes

www.laterlifetraining.co.uk ©Dawn Skelton 2018 @LaterLifeTrain

Lack of Fidelity!

- More than half the class seated
  - Highly challenging balance
- Average duration 8 weeks and frequency once per week! = 8 hours!
  - Ineffective dose
  - Or …. increase confidence before ability ☹
- Little or no strength progression
  - Ankle weights often not increased (or used!) in Otago-based services
  - Max 2 therabands progression in FaME-based services
  - Lack of strength progression
- No floorwork (FaME)
  - Key element to reduce fear and increase confidence

Cutting corners, Cherry picking and Risk Aversion!

RCP Exercise Falls Audit 2012

Otago Exercise Programme Leader (OEP)

- **Based on OTAGO RCTs** – *Campbell, Robertson et al. 1997, 2001, 2006; Liu Ambrose 2009*.
- **Trained over 2750 OEP Leaders** - physiotherapists, occupational therapists, rehabilitation and technical assistants, exercise instructors, nurses, social care workers.
- **41%** of falls services have a qualified **OEP** leading exercise *(RCP, 2012).*

Otago Key Elements

- Delivered at home or in groups by a trained OEP leader
- Lower limb muscle strength and balance exercises individually tailored from a set programme
- Frequency - 3 x p/w
- Intensity - Moderate
- Progressive
- Session Duration - 30 mins
- Programme Duration – 1 year
- + Walking (30 mins x 2 p/w)

Suitability for inclusion assessed and confirmed by appropriate health professional. (Local protocols as agreed depending on leader/instructor skill sets)

- ✓ Living at home
- ✓ Able to walk/mobilise indoors without aid
- ✓ Able to independently walk outdoors (or with 1 stick)
- ✓ 65+ (most effective >80, previous fall in past year)
- ✓ Able to rise from chair without assistance
- ✓ No contraindications to exercise
- ✓ Able to follow simple instruction
- ✓ No co-morbidities (unless L3/L4 qualified instructor)

OEP Key Elements

HOME SUPPORTED EXERCISE

- X 4 home visits in first 2 months
- Booster visit at 6 months
- 1 hour first visit, 30 mins subsequent visits
- Telephone call x 1 p/m between visits
- Exercises (warm up, strength, balance, flexibility, cool down)
- Can be supported by booklet, video or DVD *(Davis, BMJ Open, 2016; Benavent-Caballer, Physio, 2016)*
- Walking

Motivational Interviewing and behavioural support is predictive (OR 2.5) of exercise adherence

(*Arkkukangas, JAPA, 2017)*

Lack of home visits and ankle weight progression renders OEP less effective

(Iliffe, HTA, 2014)

OEP Key Elements

GROUP EXERCISE

- 1 hour class once a week (can be more)
- Two home unsupervised sessions a week
- Giving the same total frequency and duration of programme as home based version

- Evidence suggests that progression is faster and that strength and balance improves more quickly with a group delivered programme *(Kyrdalen, Physio Res Int. 2014)*

Postural Stability Instructor (PSI)

- Based on **FaME RCT in women with history of 3 or more falls in previous year** *(Skelton et al. 2005).*
- Replicated in **ProAct65+ study in men and women aged 65+ sedentary and risk of falls** *(Iliffe et al. 2014).*
- FaME is **cost effective** (*PHE, 2017*)

- **Trained over 3000 PSIs instructors** - physiotherapists, exercise instructors, occupational therapists, technical/rehab. assistants and nurses

- **54% of falls services** have a qualified **PSI** leading exercise (*RCP, 2013*).
- The **ONLY** L4 Skills Active Endorsed Falls Qualification

FaME in frequent fallers

Falls risk decreased by half – RR 0.46

Significantly less people in exercise group had died, entered a nursing home or were in hospital after 3 years

- 10% in exercise group had died, were in Hospital or in a nursing home compared to 33% of those not exercising

Skelton et al. Age and Ageing, 2005: 34: 636-639

Improved:

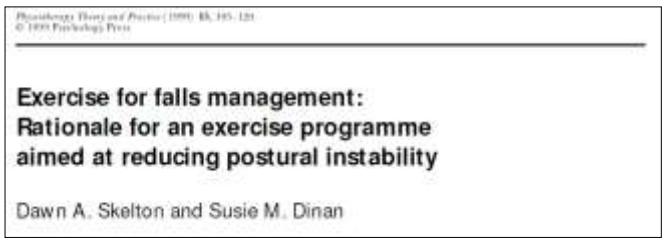
Ankle strength (plantar/dorsi; inversion/eversion)
Hip extension
Lower limb power
Single leg stance (eyes open/closed)
Functional Reach
Timed Up and Go
Floor rise time

Reduced:
Asymmetry in thigh and ankle strength

Maintained:
Bone Mineral density at spine and hip

Skelton et al. J.Aging Phys Act 2004 & 2008.

FaME Key Elements


Exercise for falls management:
Rationale for an exercise programme aimed at reducing postural instability

Dawn A. Skelton and Susie M. Dinan

- Asymmetry
- Power in lower limbs
- Strength of ankles
- Static and Dynamic Balance
- Flexibility (ankles and leg/hip)
- Endurance work
- Tai Chi in cool down
- Floorwork to regain skills
- Include all components of fitness
- Meet ACSM guidelines for exercise for older people
- Social time and peer support
- No more than 10 people per instructor

Importance of floor work

- To avoid long lies
- To reduce fear of falls
- To get in and out of the bath
- To engage in fun activities again

- Yet the most common element of FaME not provided in practice ☹

- Health & safety policies
- Lack of staff to supervise
- Risk aversion of providers


To Caz

Thank you so much.

Over the holidays I played a game with my granddaughter. This was a really special moment for me because until now I have never been able to join in the game with the whole family. For the first time I was able to get down on the floor and get up again with no difficulty. This was possible for me because of the balance and the instructions for getting down and up from the floor that you have given me. This work has not only helped me to be more safe but allowed me to join in the family fun. Many many thanks Linda xxx

Balance Messages

Highly challenging Balance Training

- Exercise in standing involving:
  - movement of the centre of mass
  - narrowing of the base of support
  - minimising upper limb support
- Feeling wobbly!
- i.e. NOT CHAIR BASED and must be tailored to each individuals ability to balance

Sherrington et al. Br J Sports Med.2017.

FaME – Self Reported Outcomes

- Fun and social activity
- Confidence in balance
- Reduced anxiety and fear
- 'tripping' not 'falling'
- Playing with grandchildren
- 'Caring' skills
- Returned to playing tennis!
- Still in contact on FB ;)

OEP/FaME in people with Learning Disabilities

- People with LDs fall and fracture more and earlier than the general population
  - Lower baseline of ability and function
  - Outcomes visible much earlier than in older adults
- FaME/Otago mix (UK)
  - 70% of clients referred to exercise, 54% completed the programme (12 weeks, 3xp/w)
  - Improvements in balance and mobility and reduction on falls (carer reported)
- Otago (US)
  - 7 week programme (3 x p/w)
  - Improvements in physical function and in a few, ambulation independence
- People with LDs living longer and will appear more in our services
- Reasonable adjustments are possible for facilitating DEXA scans

Crockett et al. J Appl Res Intellect Disabil. 2015; Petropoulou et al. J Appl Res Intellect Disabil. 2016 ; Renfro et al. Frontiers in Public Health 2016

FaME - Further Published Evidence


Primary Health Care Research & Development 2015; 16: 135–141
doi: 10.1017/S1463423614000024

RESEARCH

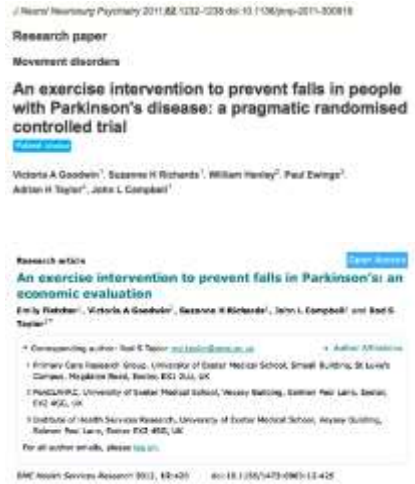
A community-based Falls Management Exercise Programme (FaME) improves balance, walking speed and reduced fear of falling

Pui Yee Young[1], Wayne Chan[2] and Jean Woo[1]

[1]Department of Medicine and Therapeutics, The Chinese University of Hong Kong, Shatin, Hong Kong
[2]Hong Kong Society for the Aged, Hong Kong

- 9 months FaME in Hong Kong (PSI led)
- People aged >60, fall in last year, fear of falls and avoiding activity
- Significant improvements in **balance, walking speed and self-efficacy (reduced fear)**
- Low drop out rate (<15%) and high attendance (79%)
- Used Goal Attainment Scale (GAS)
- Factors that motivated continued participation include the regular and long-term nature of the programme – helps reinforce exercise habits - the simplicity of movements and friendliness of the group.

FaME - Further Published Evidence


J Neurol Neurosurg Psychiatry 2011;82:1232–1238 doi:10.1136/jnnp-2011-300818

Research paper

Movement disorders

An exercise intervention to prevent falls in people with Parkinson's disease: a pragmatic randomised controlled trial

Victoria A Goodwin[1], Suzanne H Richards[1], William Henley[2], Paul Ewings[3], Adrian H Taylor[4], John L Campbell[1]

Research article

An exercise intervention to prevent falls in Parkinson's: an economic evaluation

Emily Fletcher[1], Victoria A Goodwin[1], Suzanne H Richards[1], John L Campbell[1] and Rod S Taylor[2]*

- Primary Care Research Group, University of Exeter Medical School, Smeall Building, St Luke's Campus, Magdalen Road, Exeter, EX1 2LU, UK
- PenCLAHRC, University of Exeter Medical School, Veysey Building, Salmon Pool Lane, Exeter, EX2 4SG, UK
- Institute of Health Services Research, University of Exeter Medical School, Veysey Building, Salmon Pool Lane, Exeter EX2 4SG, UK

- Evidence for the benefits of adapted FaME/PSI exercises (10 weeks duration) in patients with **Parkinson's Disease** has been published in *J Neurol Neurosurg Psychiatry* in 2011 and an **economic evaluation** of the intervention in *BMC Health Services Research* in 2012.
- Improvement in Berg balance, and recreational physical activity levels
- Reductions in fear of falling

FaME in visual impairment

Postural Stability Instructor | Otago Exercise Programme Leader

BMJ Open **Visually Impaired OLder people's Exercise programme for falls prevenTion (VIOLET): a feasibility study protocol**

Dawn A Skelton,[1] Cathy Bailey,[2] Denise Howel,[3] Mima Catlan,[4] Vincent Deary,[5] Dot Coe,[6] Lex D de Jong,[7] Sheena Gawler,[8] Joanne Gray,[9] Roxy Lampitt,[9] Jennifer Wilkinson,[9] Nicola Adams[9]

- 2-centre mixed methods, randomised, feasibility study
- Working with older people with visual impairment to adapt an existing falls prevention exercise intervention
- Primary outcome = fear of falling
- 80 participants in Newcastle and Glasgow

KEY LEARNING (In press)

- No change in exercises but changes in delivery and support strategies
- Small group sizes and multiple instructors for floor work
- Directions and transitions – painting a picture with words
- Class management skills vital
- Unless have multiple sensory impairments can join general FaME class

Skelton et al. BMJ Open. 2016;6(8):e011996

Transitioning onto other exercise opportunities

Postural Stability Instructor | Otago Exercise Programme Leader

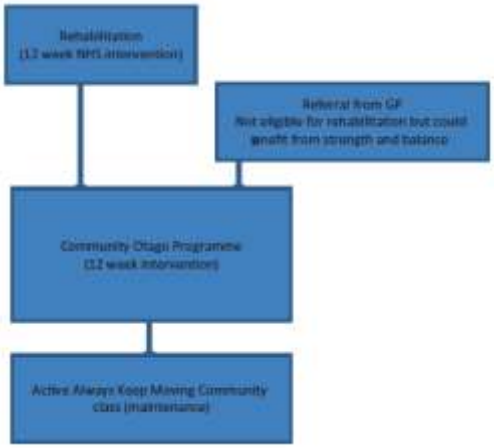
- Important to:
  - encourage an active lifestyle beyond rehabilitation
  - meet effective dose requirements (>50 hours)
  - work on bone health improvements
  - change exercise habits and increase social involvement
- But
  - Barriers to continuation after 'rehabilitation' in those with multiple comorbidities!
    - perceived cost (43%), travel time (43%), and physical symptoms (39%)
  - Facilitators to continuation…..
    - case manager (82%), a supported transition following rehabilitation (78%), and a condition-specific program (78%)

Physiotherapy Rehabilitation
↓
Specialist Exercise Professionals
↓
Fitness /Physical Activity Leaders
↓
Self Management

Sherrington 2017, Skelton 2001, PHE 2017, Desveaux JAPA 2016

OEP/FaME in practice

- Step down model to aid transition on for effective dose requirements
- 12 week group OEP exercise community based programme following on from 12 week NHS run programme – followed by unlimited time strength and balance sessions (Always Active, based on FaME)
- 63% of people transitioned on to ongoing sessions in Always Active
- There was a reduction in falls admissions, attendance at A&E and admission for fractures over the period that participants attended the intervention



Hawley Hague, Physio Theory Practice 2017

Otago/FaME in practice

I can now get upstairs and sleep in my own bed for the first time in years! (Community Otago group 3, F1)

My knee, well, they were thinking oh you're going to have to have an operation, but it's much, much better. (Community Otago group 3, F2)

It has lifted my spirits, I suffer from depression and it really helps. (Active Always Group 1, M3)

Well I think you look forward to it each week don't you, meeting up and having your dinner with your friends. (Active Always group 1, M3)

Activity Compensation?

- Frailer older people **compensate** by being less physically active because they are doing strength and balance exercise (fatigue, perception of energy, lack of understanding)
- We have to have the conversation – these exercises have to be in addition to moving more often…
- **Sedentary behaviour** leads to poor outcomes, independent of 'activity' behaviour!
  - linked to musculoskeletal pain and can affect quality of life, social inclusion and engagement

Waterman et al. Trials 2016; Remillard et al. Gerontologist 2017; Dogra et al. BJSM, 2017.

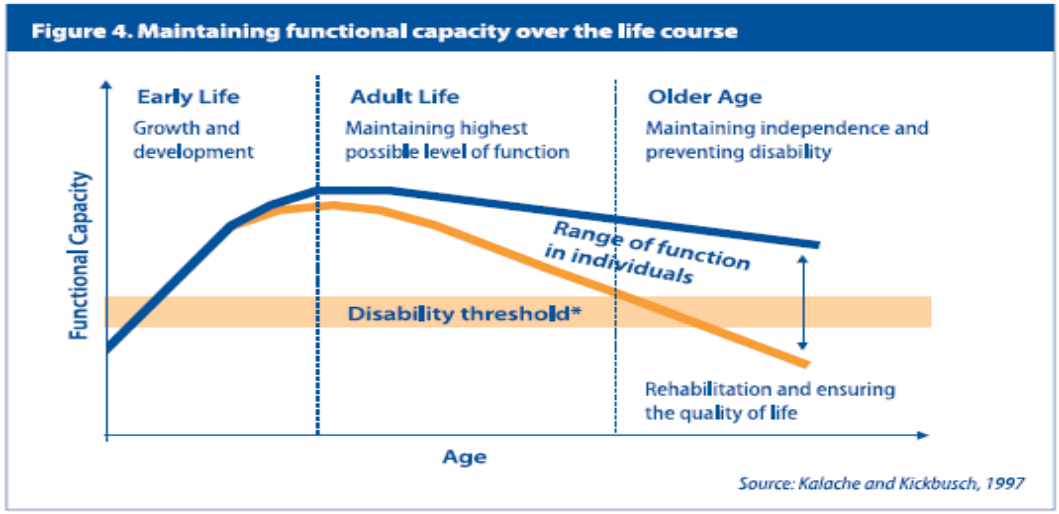
Support and Encouragement

A programme is more than a series of exercises
PARTICULARLY A HOME EXERCISE PROGRAMME!!!

- Examples from successful falls and exercise programmes
- A range of strategies that support participants eg.
  - Goal setting and self monitoring
  - Overcoming obstacles and difficulties (lapses/relapses)
  - Educating the participant
  - Highlighting successes
  - Providing individual and group support

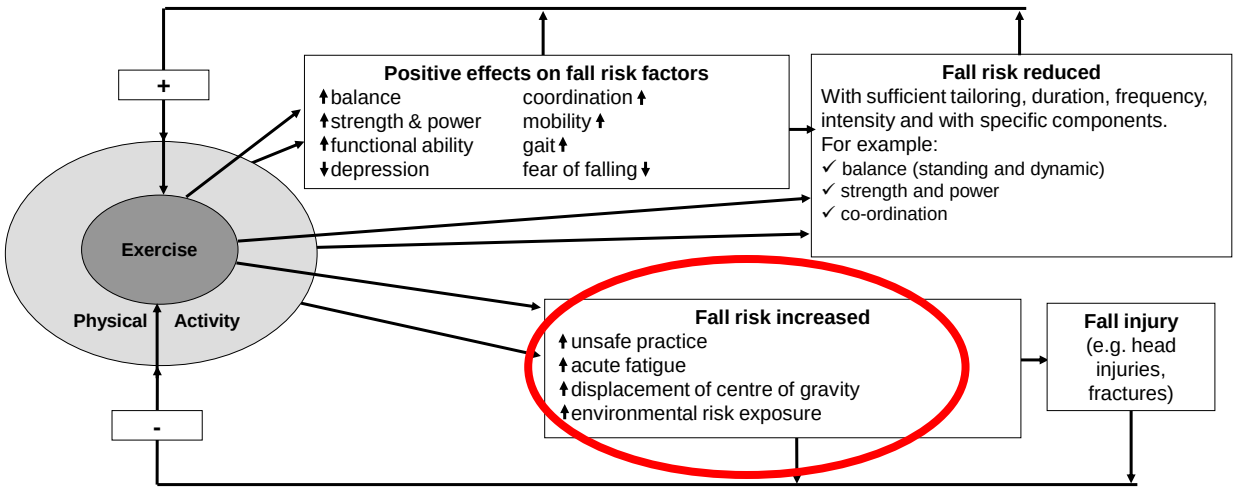
Cutting corners, Cherry picking and Risk Aversion!

Postural Stability Instructor | Otago Exercise Programme Leader



When things go wrong?

Postural Stability Instructor | Otago Exercise Programme Leader



Adapted from Skelton, 2001, Age Ageing

Lack of Fidelity!

- More than half the class seated
  - Highly challenging balance
- Average duration 8 weeks and frequency once per week! = 8 hours!
  - Ineffective dose
  - Or …. increase confidence before ability ☹
- Little or no strength progression
  - Ankle weights often not increased (or used!) in Otago-based services
  - Max 2 therabands progression in FaME-based services
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- No floorwork (FaME)
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Cutting corners, Cherry picking and Risk Aversion!

RCP Exercise Falls Audit 2012

Frailty & Exercise

- Care is needed when working with the frailest!
- 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*

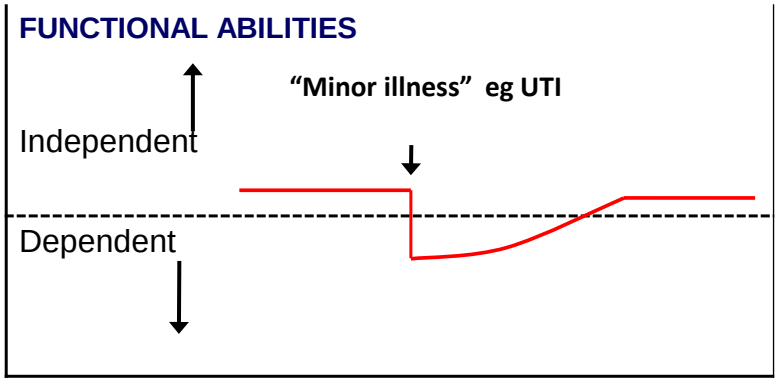
Falls on discharge from hospital

- N=340 people average age 81.2 yrs, 70% had fallen in last year
- Home exercise, 20-30 mins x 6/week (WEBB programme)
  - Physiotherapist home visits, 10 times over 12 months.
- Outcomes
  - Improvement in mobility but **INCREASE IN FALLS (40%)!!**
- Why?
  - Mostly unsupervised, was those who walked faster at discharge who fell more
  - Poor adherence (60% still exercising at 12 months)
  - Average medications = 7 (cf. Otago studies 2-3)

Sherrington et al. PLOSOne. 2014

Frailty - a loss of physiological reserve

Frailty syndromes (and falls) present in crisis



(Clegg, Young, Rockwood Lancet 2013)

If people are that close to their threshold they can easily cross it again with deconditioning.

Need effective supervision if frail.
Need to remember that when they stop exercising they will decline in function.

Forthcoming research with OEP

- What is the comparative effectiveness of advice, exercise and MFFP for preventing falls & fracture?
- What is the relative effectiveness in subgroups by age, sex and fall history?
- Which strategy is most cost-effective?
- What is feasible and acceptable to patients?

- 3 arm cluster RCT – 60 practices in primary care
- 9000 participants aged > 70 years, community dwelling
- Outcomes: fractures, falls, quality of life, mortality, costs

Finnegan et al. Physiotherapy. 2018;104(1):72-79
Bruce et al. BMJ Open. 2016;6(1):e009362.

Exer-game development

Aimed at increasing adherence to home exercise, and progression of intensity and challenge

e.g.

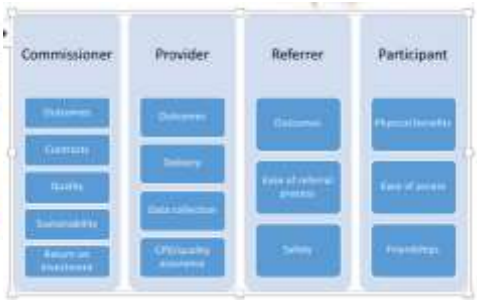
Opportunity

- ActiveLifestyle (de Bruin/van het Reve)
- Dance Dance Revolution (Smith/Lord)
- MIRA Otago and FaME (Stanmore)
- Otago (Uzor/Baillie)
- FaME (Hawley Hague)
- PreventIT - E-LIFE (Helbostad)
- SAFESTEP (Sandlund)

Ongoing Research with FaME

Postural Stability Instructor | Otago Exercise Programme Leader

Physical activity
Implementation
Study
In
Community-dwelling
Adu**I**ts



- Nottingham, Derby and Leicestershire
- Using mixed-methods to explore the implementation of FaME.

1) Effectiveness - Does FaME still work in the real world setting?
2) Is fidelity preserved in the real world setting? (Carroll Framework)
3) What works to facilitate implementation? (Consolidated Framework for Implementation Research (CFIR)

Carpenter. Inj Prev. 2018 Jan 5. pii: injuryprev-2017-042627.

PhISICAL Videos

Postural Stability Instructor | Otago Exercise Programme Leader

Setting up a FaME programme

Thinking of taking part in a strength and balance exercise class?

Why refer people to a FaME programme?

PhISICAL Videos

Campaigning on falls

http://profound.eu.com/

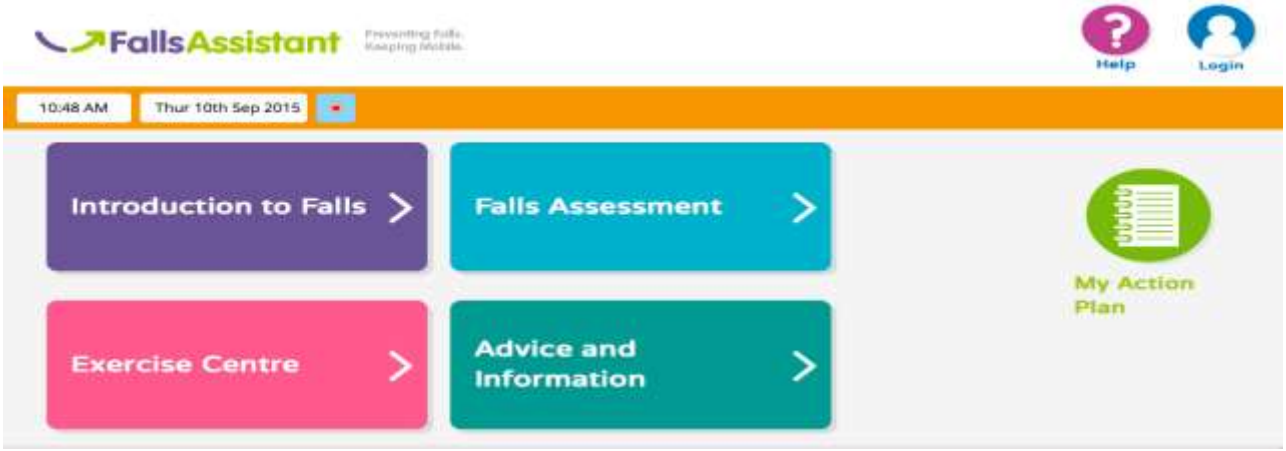
CSP Falls Prevention Video

- http://www.csp.org.uk/news/2017/09/27/csp-launches-video-demonstrate-six-simple-exercises-stop-falls

Take the balance challenge in Scotland

- http://www.knowledge.scot.nhs.uk/ahpcommunity/ailip.aspx
- Super 6 exercises & Take the Balance Challenge
- Can you?

Self management and falls



https://fallsassistant.org.uk

Home Based Exercise Resources

Free Home exercise booklets translated into 14 EU languages
http://www.profound.eu.com and on
https://www.laterlifetraining.co.uk/llt-home-exercise-booklets/
and Shop for DVD / CD *(used in Davis et al. 2016)*

Otago Follow Me DVD

Implementation Guidance

https://www.laterlifetraining.co.uk/llt-guidance-implementation-oeppsi-community-programmes/

Finally....

- OEP and FaME, when delivered with fidelity to the original published interventions WORK and are cost-effective
- They won't be unless delivered with fidelity!
- Cherry picking the bits of the interventions which fit your budget or your resources (trained staff, duration etc) will make them less effective
- For further information about training watch https://youtu.be/oucpeP83FoQ