

# Dementia and Preventing Falls



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# Older Australia at a glance

In 2016, 3.7 million people  
(15% of our total population)  
are **older Australians**

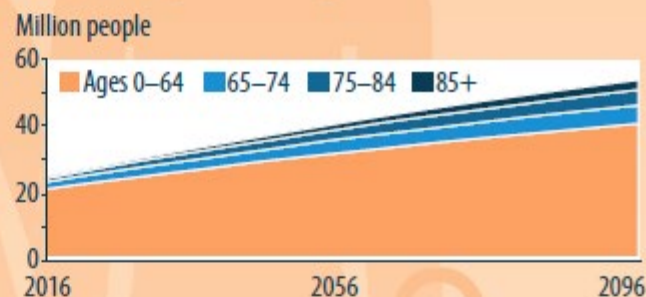


## The older Australian population is growing

**15%** in 2016 (3.7 million people)

**22%** by 2056 (8.7 million)

**24%** by 2096 (12.8 million)



## And they are still independent and healthy

**67%** do not use aged care services

**72%** reported good or better health

**76%** own their own home

**93%** do not smoke

**30%** volunteer time and skills

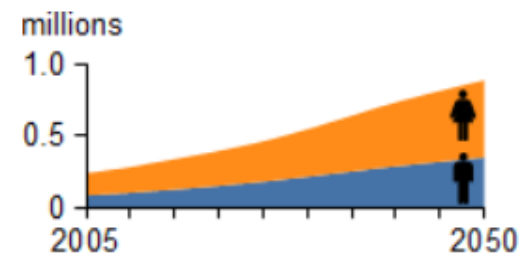
**41%** are still sufficiently active

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## Dementia in Australia

### 342,800

Australians were estimated to have dementia in 2015. Based on projections of population ageing and growth, the number of people with dementia will reach almost 400,000 by 2020, and around 900,000 by 2050.



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### 1 in 10

Australians aged 65 and over (10%) had dementia in 2015.



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### 3 in 10

Australians aged 85 and over (31%) had dementia in 2015.



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### Over 50%

of permanent residents in Australian Government-funded aged care facilities in 2013–14 had a diagnosis of dementia.



# Falls in People with Dementia

- Annual falls incidence is 60-70% in people with dementia.
- Fractures are up to 3x commoner in people with dementia.
- Psychotropic drug use more common in people with dementia.
- 14% of admissions to hospital for people with dementia are fall related.
- When admitted to hospital, people with dementia have poorer outcomes including adverse events.

# Multifactorial intervention after a fall in older people with cognitive impairment and dementia presenting to the accident and emergency department: randomised controlled trial

Fiona E Shaw, John Bond, David A Richardson, Pamela Dawson, I Nicholas Steen, Ian G McKeith, Rose Anne Kenny

Variable	Intervention group (n=130)	Control group (n=144)
Mean age (years) 95% CI	84 (71 to 97)	84 (71 to 97)
No (%) female	101 (78)	118 (82)
No (%) resident in community at study entry	34 (26)	26 (18)
Mini-mental state examination score*	14 (6-18)	12 (6-18)
No (%) with dementia†	118 (91)	128 (89)
Chronic conditions	3 (2-5)	3 (2-5)
Falls in previous 6 months	2 (0-4)	2 (0-4)
Environmental risk factors	2 (1-4)	2 (1-3)
Gait score‡	16 (13-17)	15 (12-17)
Balance score‡	28 (20-33)	27 (19-35)

\*Higher score better—less cognitively impaired.

†ICD-10 research criteria for dementia.

‡Gait and balance components of modified performance orientated mobility assessment; lower score better.

<b>Outcome</b>	<b>Intervention group (n=130)</b>	<b>Control group (n=144)</b>	<b>Relative risk ratio (95% CI)</b>
Patients falling in 1 year	96 (74)	115 (80)	0.92 (0.81 to 1.05)
Median No of falls (interquartile range)*	3 (0, 7)	3 (1, 8)	-0.02 (-0.32 to 0.09)†
Median time (weeks) to first fall (interquartile range)	11 (2, 41)	11 (2, 33)	P=0.459‡
Major injury	37 (28)	31 (21)	1.32 (0.87 to 2.00)
Fractured neck of femur	6 (5)	12 (8)	0.55 (0.21 to 1.43)
Fall related accident and emergency department attendance	52 (40)	46 (32)	1.25 (0.91 to 1.72)
Fall related hospital admission	19 (15)	19 (13)	1.11 (0.61 to 2.00)
Mortality	27 (21)	29 (20)	1.03 ( 0.65 to 1.64)

\*Corrected for diary returns.

†Estimated mean difference (95% confidence interval).

‡Log rank test.

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\*Corrected for confounding

†Estimated median (interquartile range) (95% confidence interval).

‡Log rank test.

# Undertreatment of osteoporosis in persons with dementia? A population-based study

Y. Haasum • J. Fastbom • L. Fratiglioni • K. Johnell

**Table 2** Odds ratios (ORs) with 95% confidence intervals (95% CIs) for use of osteoporosis drugs

	Crude ORs (95% CI)	Age- and sex-adjusted ORs (95% CI)	All variables in the model ORs (95% CI)
Whole population ( <i>n</i> =2610)			
Age (continuous variable)	1.01 (0.99–1.02)	1.00 (0.98–1.01)	1.01 (0.99–1.03)
Female versus male	5.98 (3.88–9.20)	6.07 (3.93–9.37)	6.24 (4.04–9.64)
Presence of dementia	0.43 (0.27–0.70)	0.32 (0.19–0.53)	0.34 (0.19–0.59)
Any osteoporotic fracture	1.28 (0.87–1.89)	1.12 (0.75–1.68)	1.36 (0.90–2.06)
Living in institution versus own home	0.66 (0.43–1.01)	0.53 (0.34–0.84)	0.82 (0.49–1.36)
Subpopulation including only persons with MMSE $\geq$ 10 ( <i>n</i> =2,493) <sup>a</sup>			
Age (continuous variable)	1.01 (1.00–1.03)	1.00 (0.99–1.02)	1.01 (1.00–1.03)
Female versus male	6.40 (4.12–9.94)	6.37 (4.09–9.92)	6.48 (4.16–10.1)
Presence of dementia	0.40 (0.22–0.74)	0.30 (0.16–0.57)	0.32 (0.17–0.60)
Any osteoporotic fracture	1.32 (0.87–2.00)	1.12 (0.73–1.73)	1.27 (0.82–1.97)
Living in institution versus own home	0.74 (0.45–1.21)	0.61 (0.36–1.02)	0.78 (0.46–1.34)

<sup>a</sup> Exclusion of 117 individuals with MMSE<10 (110 persons with dementia and seven persons with either MMSE <10 or missing value)

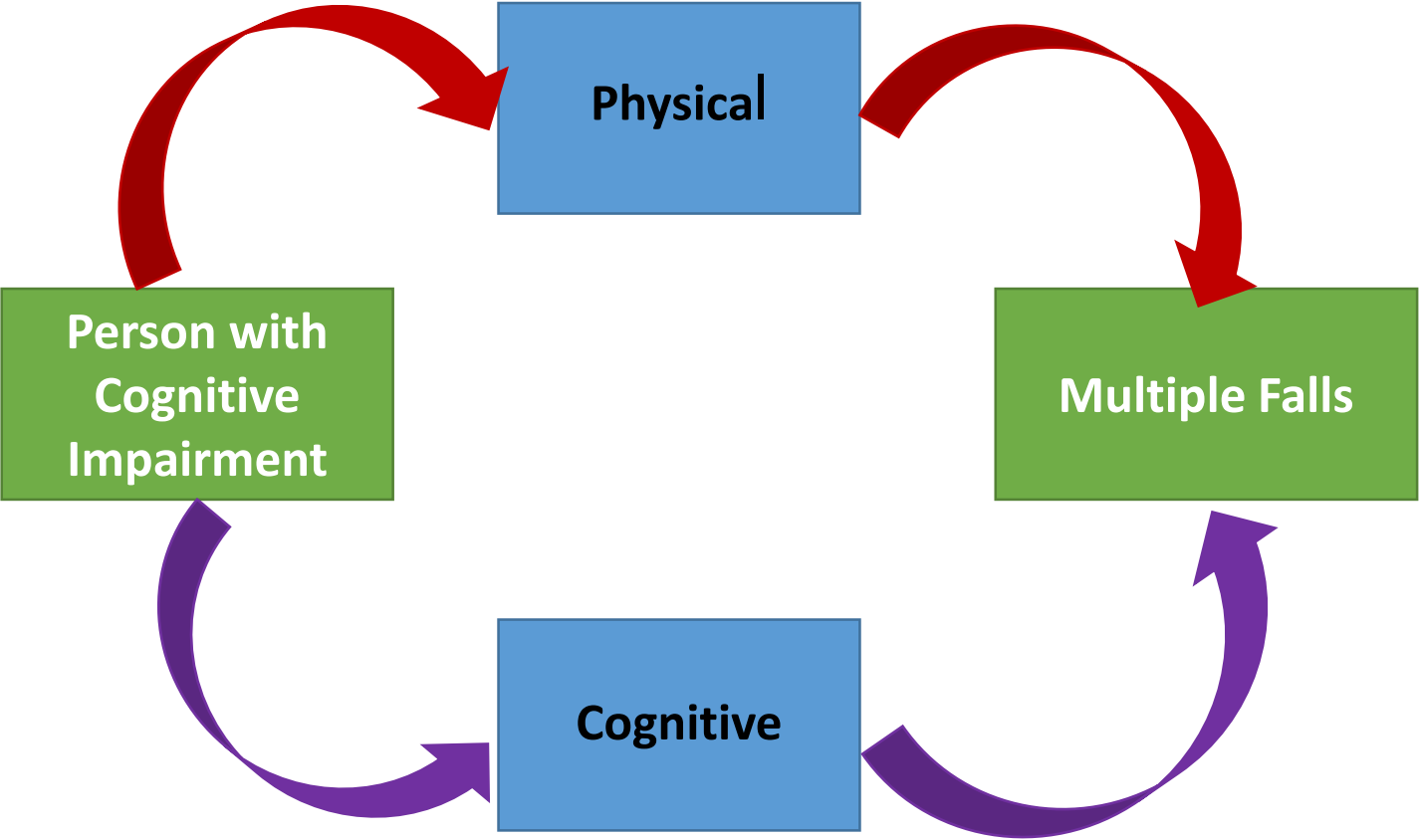


# FOCIS

## Falls in Older Cognitively Impaired Subjects



# Understanding the increased risk



# Observational cohort study

- **177 older community dwelling older people with CI/dementia**
- **Demographic information**
- **Medical history & medication use**
- **Physical and cognitive test battery**
- **Followed up for 1 year**

# Multivariate Model

Table 4. Multivariate Analysis of Potentially Modifiable and Explanatory Fall Risk Factors

Variable	Median Cut Point	IRR (95% CI)	<i>p</i> value
Explanatory variables			
Sway on foam*	>1,900 mm <sup>2</sup>	2.13 (1.43–3.15)	<b>&lt;.001</b>
Co-ordinated stability*	>30 errors	1.79 (1.16–2.75)	<b>.008</b>
Geriatric Depression scale*	>3	2.13 (1.45–3.14)	<b>&lt;.001</b>
CNS medication use	>0	1.39 (0.93–2.08)	.111
Hand reaction time*	>275 s	1.35 (0.92–1.96)	.121
Trails B*	>319 s	1.12 (0.72–1.76)	.609
Walking activity	<1.6 h/wk	1.15 (0.77–1.72)	.489
Covariates			
Age <sup>†</sup>	—	1.00 (0.97–1.03)	.933
Years of education <sup>†</sup>	—	1.03 (0.97–1.10)	.379
ACE-R score <sup>†</sup>	—	1.01 (0.99–1.03)	.200

Notes: Likelihood ratio chi square (10 *df*) = 54.88, *p* < .001; pseudo *R*<sup>2</sup> = .098; Akaike information criterion = 3.46. ACE-R higher scores represent better performance.

ACE-R = Addenbrooke's Cognitive Examination–Revised; CI = confidence interval; CNS = central nervous system; IRR = incidence rate ratio. Bold *p* values highlight significant findings.

\*Higher scores represent worse performance.

<sup>†</sup>Continuous variable.

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Balance  
Mood

*Notes:* Likelihood ratio chi square represent better performance.

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# Conclusions from Prospective Study

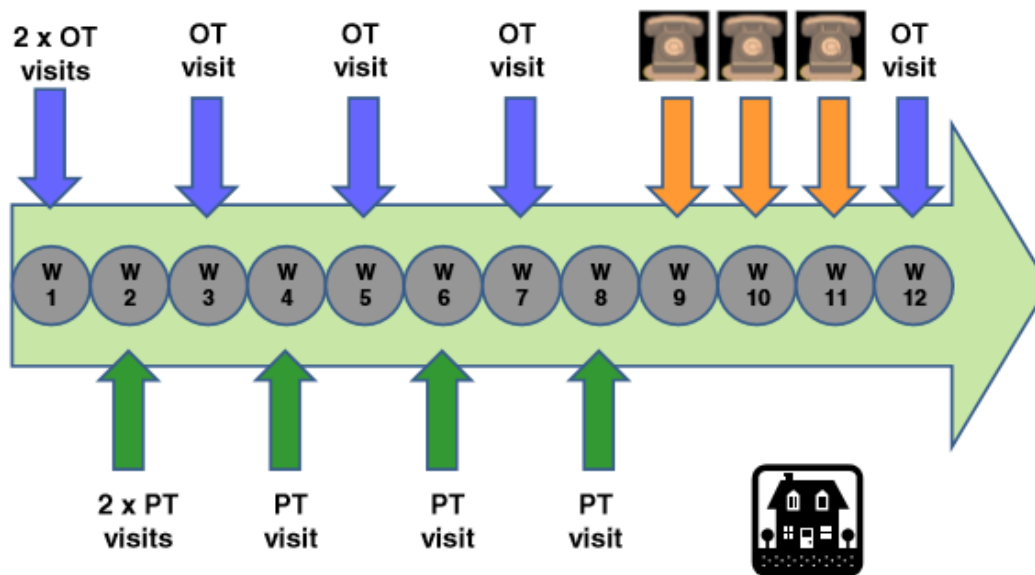
- **Physiological performance is an important determinant of falls risk**
- **Deficits identified are potentially amenable to intervention**
- **Cognitive performance is less useful in differentiating between fallers and non-fallers**
- **Logical step is to move on to pilot approach to intervention**

# 2 Questions

- **Can we engage with people with dementia and their carers to deliver an intervention**
  - *iFOCIS pilot 1*
- **Can we impact on identified risk factors**
  - *iFOCIS pilot 2*

# A feasibility study and pilot randomised trial of a tailored prevention program to reduce falls in older people with mild dementia

Jacqueline Wesson<sup>1,7</sup>, Lindy Clemson<sup>1,7\*</sup>, Henry Brodaty<sup>2,3</sup>, Stephen Lord<sup>4</sup>, Morag Taylor<sup>4,6</sup>, Laura Gitlin<sup>5</sup> and Jacqueline Close<sup>4,6</sup>

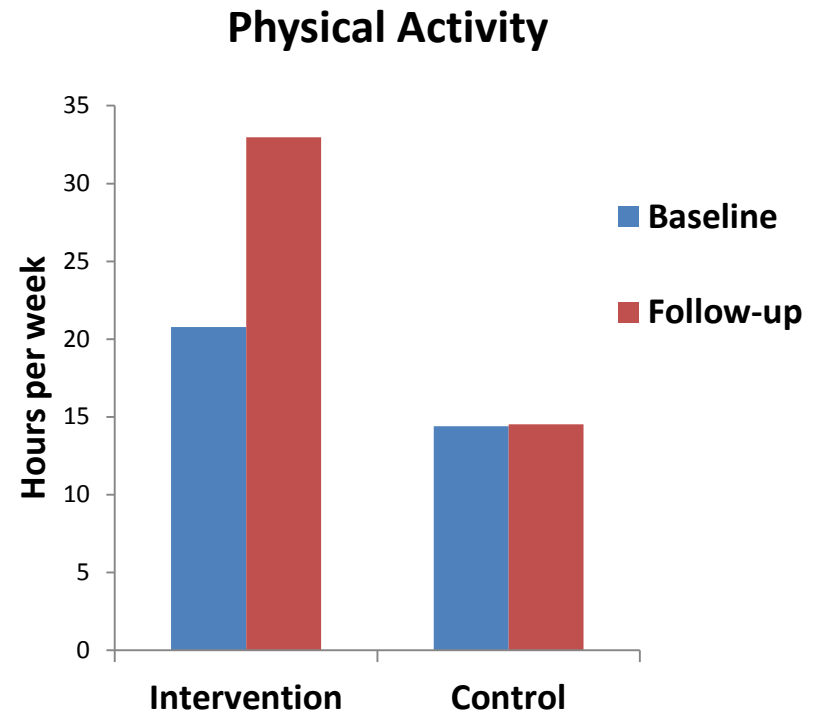


**Figure 1** Intervention schedule: occupational therapy (OT), physiotherapy (PT) visits and phone calls over 12 weeks.



# Results

- No significant differences in any physical measures
- People were exercising and undertaking home modifications
- Trend in the right directions for median change scores on physical activity hours/ week
- Not causing increased carer stress



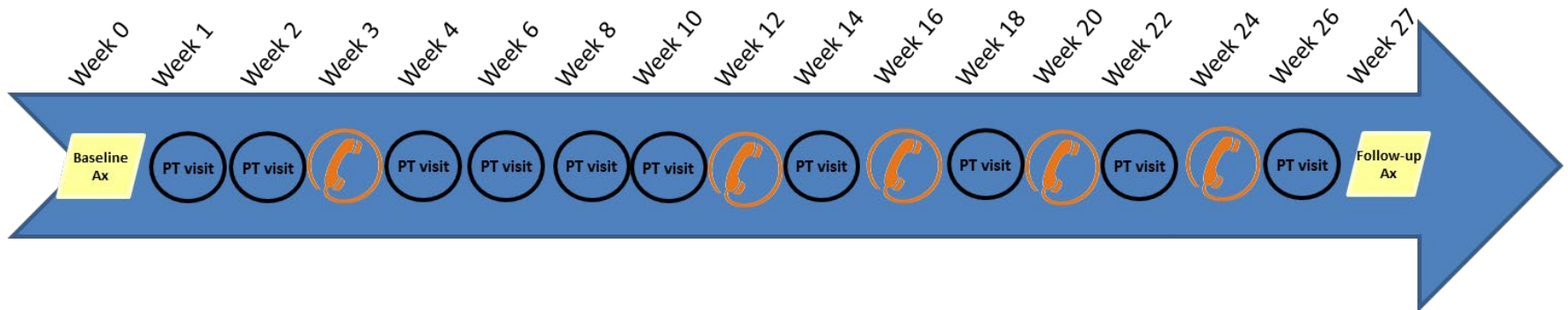
**58% reduction in falls rate - IRR = 0.42 (p = 0.28)**

# Lessons learnt

- **Intensity / duration of exercise program**
- **Flexibility of intervention protocol itself**
- **Important to have an understanding of cognitive “strengths”**
- **Strong integration & collaboration between the occupational therapist and physiotherapist crucial**

# Intervention schedule

- 10 home based physiotherapy intervention visits
- 5 support phone calls



# A home-based, carer-enhanced exercise program improves balance and falls efficacy in community-dwelling older people with dementia

Morag E. Taylor,<sup>1,2,\*</sup> Stephen R. Lord,<sup>3,4</sup> Henry Brodaty,<sup>5,6,7</sup> Susan E. Kurrle,<sup>2</sup> Sarah Hamilton,<sup>1</sup> Elisabeth Ramsay,<sup>1</sup> Lyndell Webster,<sup>1</sup> Narelle L. Payne<sup>1</sup> and Jacqueline C. T. Close<sup>1,8</sup>

Characteristic	Baseline (n=33)	Reassessment (n=33)	<i>p</i> - value
<b>Psychological assessment</b>			
Geriatric Depression Scale, median (IQR)	2.0 (0.5 – 3.0)	1.0 (0.5 – 4.0)	0.687
iconFES, median (IQR)	21 (16 – 26)	17 (14 – 21)	<b>0.040</b>
<b>Physical assessment</b>			
Hand reaction time, ms, median (IQR)	264 (229 – 341)	264 (240 – 360)	0.422
Knee extension strength, kg, median (IQR)*	24 (17 – 34)	17 (14 – 25)	<b>0.016</b>
Sway on floor, mm, median (IQR)	118 (102 – 164)	85 (54 – 128)	<b>0.001</b>
Sway on foam, mm, median (IQR)	372 (250 – 668)	200 (118 – 909)	<b>0.007</b>
Coordinated stability, errors, median (IQR)	28 (17 – 45)	25 (11 – 57)	0.773
PPA fall risk score, median (IQR)	2.6 (1.5 – 3.5)	1.3 (0.6 – 4.2)	0.136
<b>Incidental and Planned Exercise Questionnaire*</b>			
Planned, h/wk, median (IQR)	0.8 (0.0 – 1.7)	1.3 (0.5 – 3.4)	<b>0.030</b>
Incidental, h/wk, median (IQR)	13.1 (7.3 – 25.9)	22.4 (6.5 – 38.2)	0.332
<b>Quality of life, median (IQR)*</b>	38 (34 – 41)	39 (34 – 41)	0.449

# Effects of the Finnish Alzheimer Disease Exercise Trial (FINALEX)

*A Randomized Controlled Trial*

*Kaisu H. Pitkälä, MD, PhD; Minna M. Pöysti, MD, PhD; Marja-Liisa Laakkonen, MD, PhD; Reijo S. Tilvis, MD, PhD; Niina Savikko, RN, PhD; Hannu Kautiainen, PhD; Timo E. Strandberg, MD, PhD*

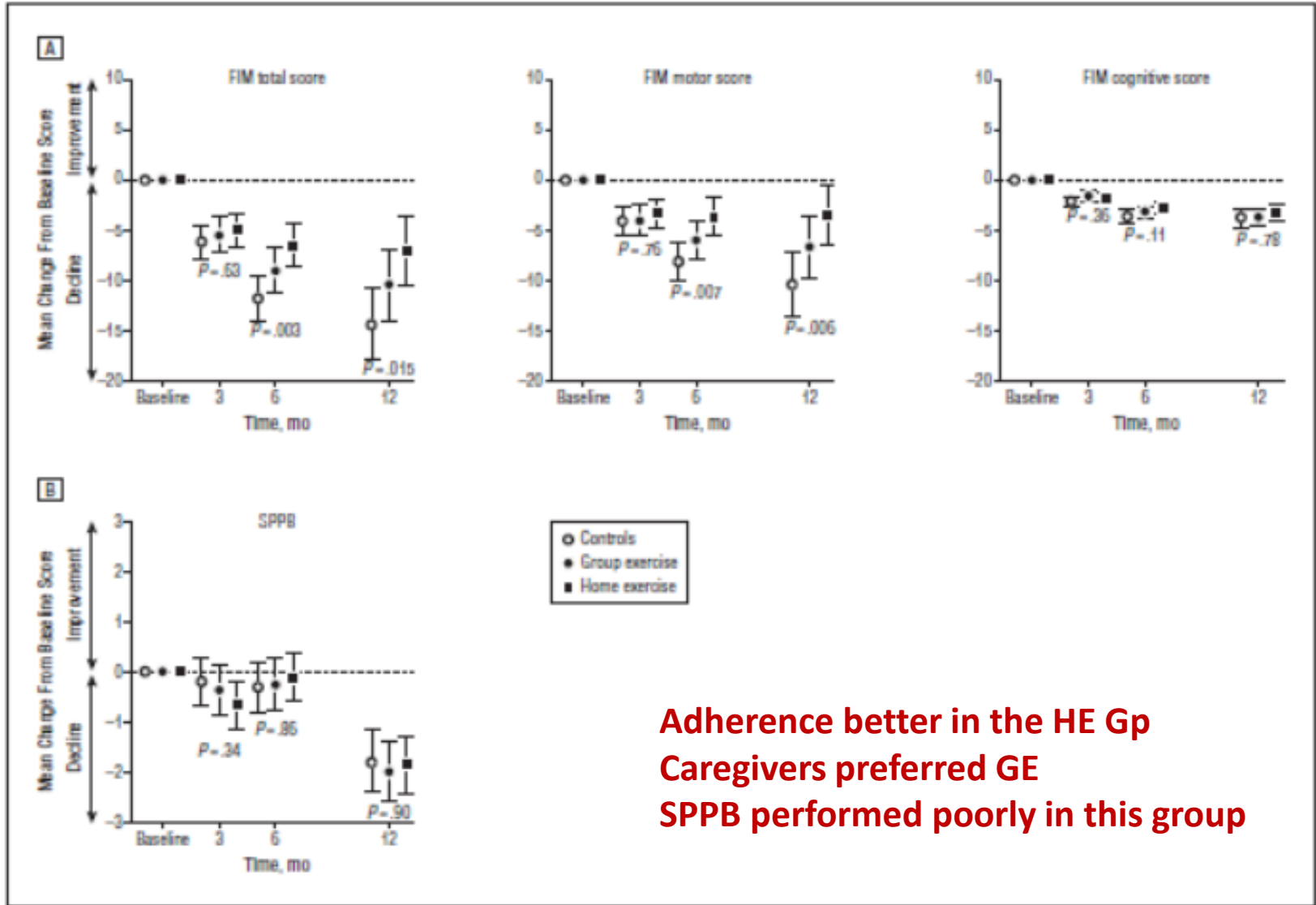
**“Investigate the effect of intense and long term exercise on physical functioning and mobility of home dwelling patients with Alzheimer’s disease”**

# Participants

- **Multicentre study**
- **210 community dwelling people with a diagnosis of Alzheimer's Disease and their spousal carer**
- **Aged 65yrs and older**
- **Able to walk independently (with or without an aid)**
- **Identified from an AD drug reimbursement register**

# Intervention

- **Home exercise: 1 hour twice a week for 12 months**
- **Group exercise: 1 hour twice a week in a group setting (approx. 10 people). Part of a 4 hour day care centre visit.**
- **Control group: Written information on nutrition and exercise**
- **Assessed at baseline, 3,6,& 12 months**
- **Primary outcome measures were FIM and SPPB**



**Adherence better in the HE Gp**  
**Caregivers preferred GE**  
**SPPB performed poorly in this group**



**Table 3. Complications Among Participants During the Intervention Year**

Variable	Home-Based Exercise (n = 68) <sup>a</sup>	Group-Based Exercise (n = 61) <sup>a</sup>	Controls (n = 65) <sup>a</sup>	P Value <sup>b</sup>
Hospital admissions				
Total No.	29	30	37	
Incidence rate (95% CI)	0.47 (0.31-0.68)	0.54 (0.37-0.77)	0.65 (0.46-0.90)	.63
Falls				
Total No.	83	101	171	
Incidence rate (95% CI)	1.35 (1.07-1.67)	1.86 (1.51-2.26)	3.07 (2.63-3.57)	.005
All fractures				
Total No.	4	5	4	
Incidence rate (95% CI)	0.06 (0.02-0.17)	0.09 (0.03-0.21)	0.07 (0.02-0.18)	.88
Hip fractures				
Total No.	3	2	3	
Incidence rate (95% CI)	0.05 (0.01-0.14)	0.04 (0.00-0.13)	0.05 (0.01-0.15)	.91

<sup>a</sup>Those patients participating in the intervention and/or attending the first follow-up assessment and returning their calendars for falls are included in these analyses.

<sup>b</sup>Poisson regression analysis with robust standard error estimates.

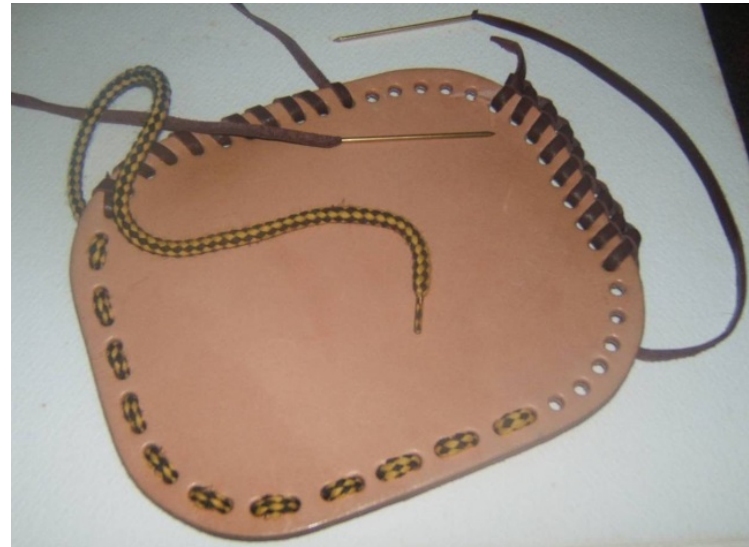
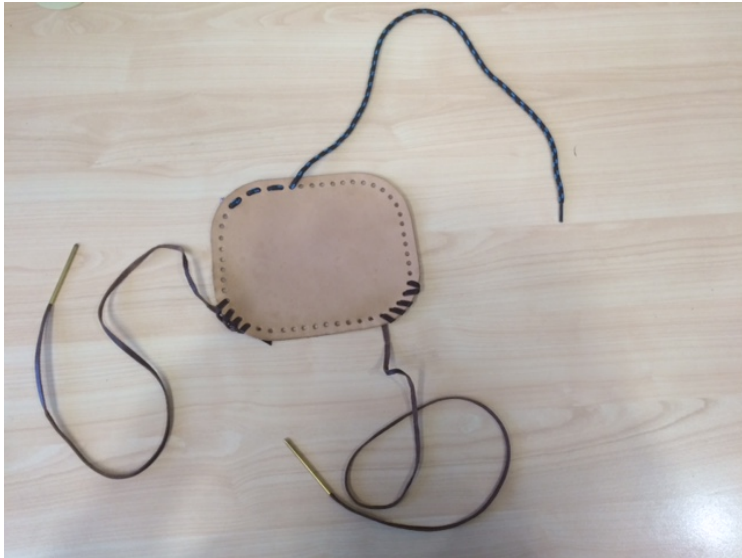
# THE i-FOCIS Overview

- **Can a professionally prescribed, carer assisted exercise and home hazard reduction program reduce falls in people with dementia**
  - **Rate of falls**
- **Secondary aims – risk falling, multiple fallers, function, QoL, uptake and adherence, cost and cost-effectiveness**

# Allen's Cognitive Disability Model

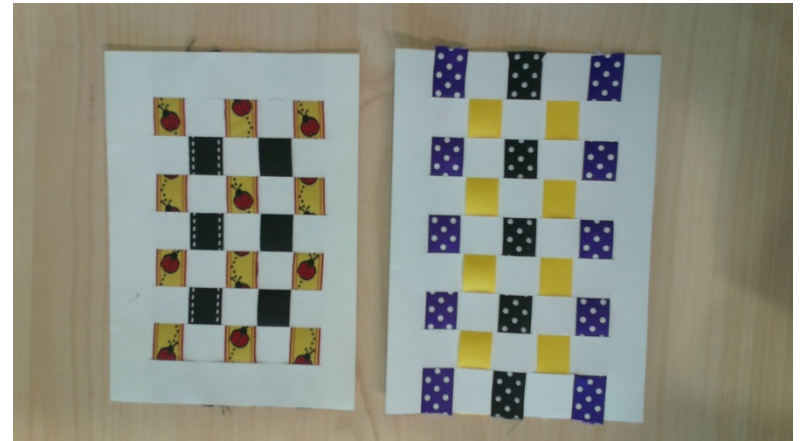
- Identifies underlying cognitive processes – focuses on preserved cognitive abilities
- Standardised manual for administration and scoring
- Provides an estimate of functional cognition
- Helps tailor content and instruction process
- Helps educate carers re expectations for behaviour

# Large Allen's Cognitive Level Screen



**Score between 3 – 5.8 based on quality and complexity of stitches**

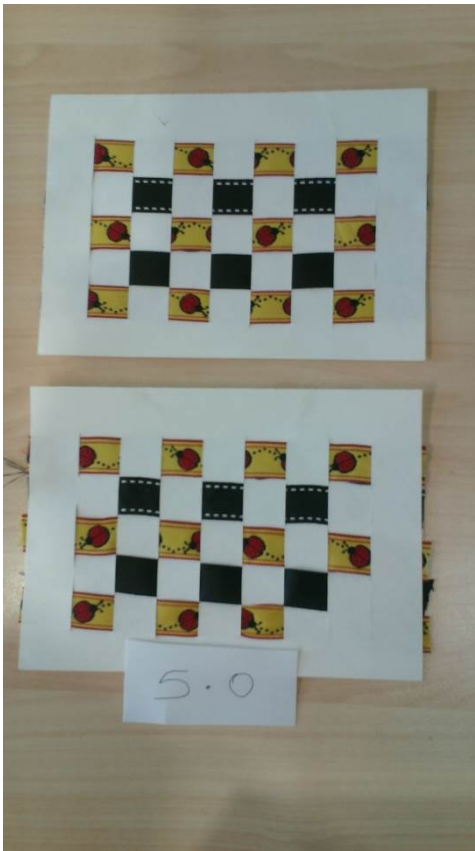
# Allen Diagnostic Module



# Catherine – LACL 5.0

- **88**
- **Lives with sister**
- **ACE-R 76**
- **FAB 13**
- **0 falls in last 12 months**
- **Knee extension strength 16kg**
- **Balance poor**

# Catherine – LACL 5.0



- Test took 25 mins
- Didn't require demonstration
- Able to copy
- Examines front and back of card
- Recognises errors
- Able to work and talk at same time
- Inconsistently seeks assistance

# Catherine – LACL 5.0

- Carer to initially provide assistance / supervision to prevent over exertion or ineffective technique
- Should progress to minimal supervision once technique mastered
- Increased supervision with new and more complex exercises
- Benefit from both photos and written instruction



# Norman – LACL 3.4

- Lives with wife
- ACE-R 51/100 (MMSE 12/30)
- Falls regularly
- Impulsive
- Knee extension strength – 20kg, unable to do sway on foam

# Norman – LACL 3.4

- Needed constant direct cues for every step

Doesn't cross the midline



Did not complete any fringing (step 1)  
Reduced fine motor skills



## ADM PLACEMAT TASK

- Did not refer to sample
- Difficulty rotating shapes – moved body & almost fell off chair
- Poor depth perception and visuospatial skills – could not see shapes under others

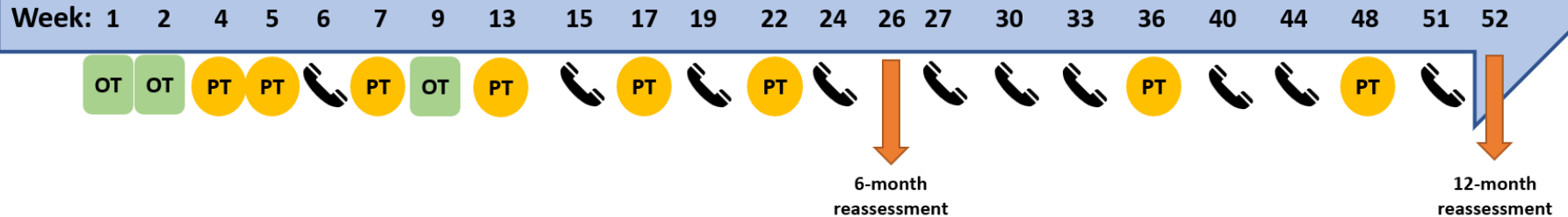
# Norman – LACL 3.4

- **Simple 1 step instructions – will not follow written instructions. Verbal cues, touch and demonstration only**
- **Will not conceptualise risk**
- **Easily distracted – no TV, radio etc**
- **Supervision at all times**
- **Will take 3-4 times longer to complete task**
- **Build on habitual actions to upgrade – may habituate after min 3 weeks training**

# Study Overview

## Example intervention schedule

(some participants had 4 OT visits and 7 PT visits; there was flexibility in the schedule based on participant/carer availability)



# Baseline

	Intervention (n=153)	Control (n=156)
Age, years	82.2	82.5
Female	81 (52.9)	70 (44.9)
Education, years	12.0	12.0
Lives alone (%)	31 (20.3)	30 (19.2)
Outdoor walking aid use	59 (38.6)	58 (37.2)
Fall in the past 12-months (%)	78(51)	85 (54.5)
Total number of medications (SD)*	6.2 (2.5)	5.6 (2.6)
Dementia (%)*	<b>122(80.3)</b>	<b>103 (66.9)</b>
Number of co-morbidities	3 (2 – 4)	3 (1 – 4)
Diabetes	31 (20.3)	19 (12.2)
GDS*	<b>2 (1-5)</b>	<b>2 (1-3)</b>
MACE	14 (9 – 19)	14 (9 – 21)
ACE-III	64 (51 – 77)	66 (53 – 79)
PPA Fall risk score	2.52	2.79

# Fall related outcomes

	Intervention (n=153)	Control (n=156)	Regression model	
			Coefficient (95% CI)	p-value
<b>Primary outcome</b>				
Incidence rate (95% CI) per 365 person days	2.32 (2.09-2.58)	2.26 (2.03-2.52)	1.05 0.73-1.51	0.782
Adjusted for baseline differences			0.78 0.57-1.07	0.127
<b>Secondary outcomes (adjusted)</b>				
Faller	94 (61.4%)	87 (55.8%)	1.00 0.83-1.24	0.984
Multiple fallers	<b>49 (32.0%)</b>	<b>58 (37.2%)</b>	<b>0.73 0.54-0.99</b>	<b>0.045</b>
Fall related hospitalisation (yes/no)	24 (15.7%)	16 (10.3%)	1.53 0.85-2.76	0.159
Fall related hospitalisation incidence rate(95% CI) per 365 person days	0.22 (0.16-0.31)	0.14 0.08-0.21	1.65 0.84-3.23	0.144

# Pre-planned analysis

	Falls Rate IRR 95%CI
Poorer physical function	1.99 1.25-3.17
Better physical function	0.45 0.26-0.77

# Secondary Outcome Measures

- EQ-5D
- iPEQ
- DAD
- GDS
- Icon-FES
- Co-ordinated stability
- Maximal balance range
- PPA



# Why didn't the intervention work

- Not enough participants
- Adherence
- Carer engagement
- Intensity of the intervention
- Wrong intervention
  - Too complex
- Wrong population
  - Look at subgroup analysis



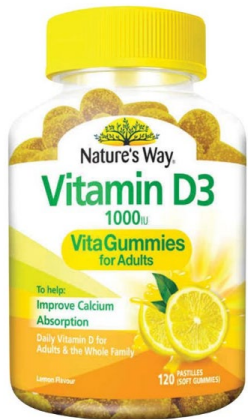
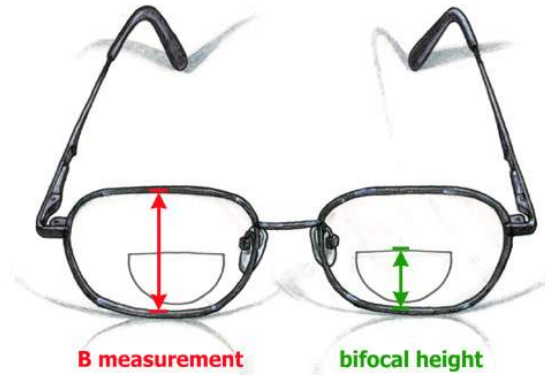
# A development study and randomised feasibility trial of a tailored intervention to improve activity and reduce falls in older adults with mild cognitive impairment and mild dementia

Rowan H. Harwood<sup>1,2\*</sup>, Veronika van der Wardt<sup>2</sup>, Sarah E. Goldberg<sup>3</sup>, Fiona Kearney<sup>1</sup>, Pip Logan<sup>2</sup>, Vicky Hood-Moore<sup>3</sup>, Vicky Booth<sup>2</sup>, Jennie E. Hancox<sup>2</sup>, Tahir Masud<sup>1,2</sup>, Zoe Hoare<sup>4</sup>, Andrew Brand<sup>4</sup>, Rhiannon Tudor Edwards<sup>5</sup>, Carys Jones<sup>5</sup>, Roshan das Nair<sup>6</sup>, Kristian Pollock<sup>3</sup>, Maureen Godfrey<sup>2</sup>, John R. F. Gladman<sup>2</sup>, Kavita Vedhara<sup>7</sup>, Helen Smith<sup>8</sup> and Martin Orrell<sup>6</sup>

# **Can we extrapolate for now?**

**If the effect of the intervention is not dependent on cognition then YES.**

# Prevent Falls



# Treat Osteoporosis



# Conclusions

- **Important high risk group**
- **Exercise may be effective – if sufficient dose**
- **Can extrapolate from trials in cognitively intact populations**
- **High priority group for treating osteoporosis**
- **Is measuring falls the right outcome?**

# Acknowledgements

## Chief Investigators

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## Team members

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Ms Linda Roylance

Ms Keri Lockwood

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Ms Lyndell Webster

Ms Cecelia Koch

Ms Beatrice John

Ms Betty Ramsay

Ms Sarah Hamilton