

# Evidence-based best practice in falls prevention – three recent initiatives



Professor Stephen Lord  
Prince of Wales Medical Research Institute

The effect of providing  
single lens distance  
glasses on falls in  
multifocal glasses wearers:  
the **VISIBLE** RCT

V isual  
I ntervention  
S trategy  
I ncorporating  
B ifocal &  
L ong-Distance  
E yewear

Haran MJ, Ivers R, Cameron ID, Lee BB, Simpson JM,  
Kwan M, Porwal M, Tanzer M, Lord SR

# Updating glasses can increase fall risk

- ▶ Intervention significantly increased the risk of falls  
– by > 50% (IRR=1.57,95%CI=1.20-2.05)
- ▶ Authors speculate that the change, irrespective of vision improvement, may have increased falls

Cumming et al, J Am Geriatr Soc, 2007

# Multifocals, Falls & Balance

- ▶ 2.3 X ↑ risk of all falls
- ▶ increase risk of outdoor falls & falls on stairs
- ▶ increase risk of falls due to trips at work
- ▶ Increase errors when stepping up a step
- ▶ Increase obstacle contacts while walking



# Multifocal Glasses

- ▶ Impair ability to see contrast and judge depth
- ▶ Focal distance of lower lenses ( $\sim 50$  cm)  $<$  distance required to see ground level obstacles ( $\sim 2$ m)

# Visible: Primary Aim

- ▶ To determine whether
  - ▶ Provision of single lens distance glasses, plus
  - ▶ Counselling and recommendations for their use for standing & outdoor activities
- ▶ can reduce falls rates in regular multifocal glasses wearers
- ▶ Assessor-blinded RCT

# Inclusion Criteria

- ▶ English-speaking
- ▶ Age 65-79 years & fall in last year / TUGT > 15 s
- ▶ Age 80+ years
- ▶ User of multifocals in community 3+ times/week
- ▶ MMSE 24+
- ▶ No acute medical problems

# Inclusion Criteria

- ▶ Review by eye practitioner in last 2 yrs
- ▶ Melbourne Edge Test score  $> 16$  dB
- ▶ Not awaiting eye surgery in next 12 months
- ▶ Does not wear single lens distance glasses
- ▶ Not currently in another falls prevention trial
- ▶ At least 'quite confident' regarding study compliance



# Recruitment (n=606)

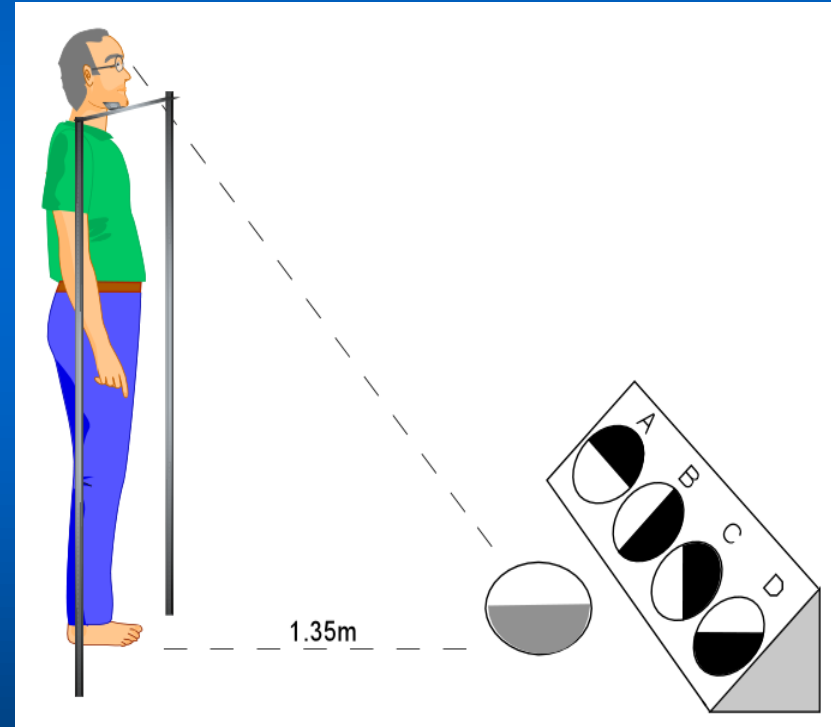
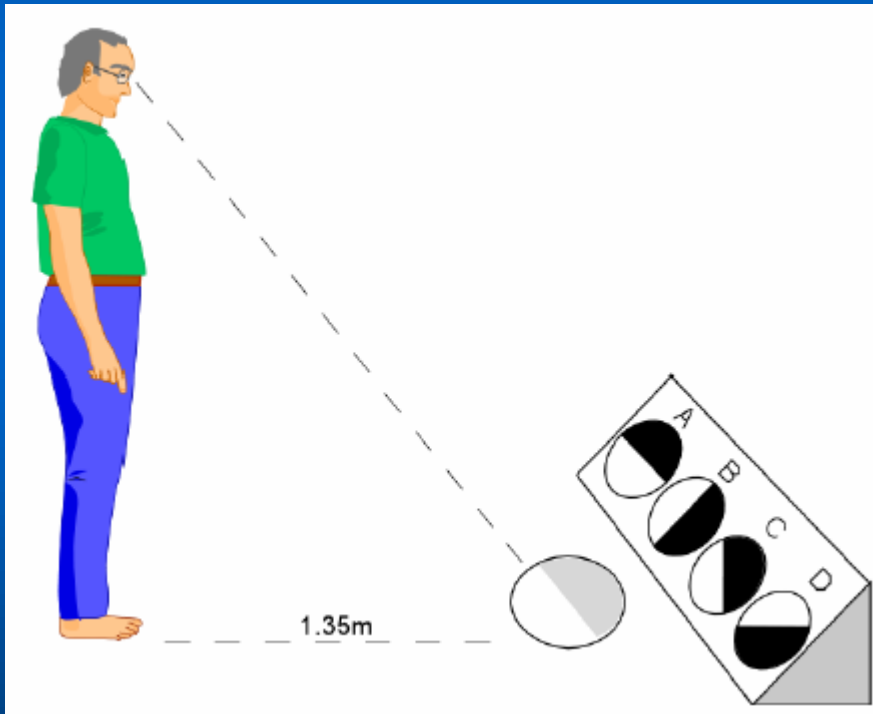
- ▶ Retirement villages
- ▶ Electoral roll
- ▶ Newspaper ads
- ▶ Media releases / coverage
- ▶ Rehabilitation wards / hospitals

# Intervention Group (n=305)

- ▶ Optometry Assessment
- ▶ Distance glasses + case
- ▶ Updated multifocals if required (n = 27, 8.9%)
- ▶ Demonstration of the effect of plain distance versus multifocals
- ▶ Pamphlet re. usage guidelines (stairs, outdoors, uneven ground, public transport)
- ▶ Blinded compliance measurement and reinforcement
- ▶ Usual care

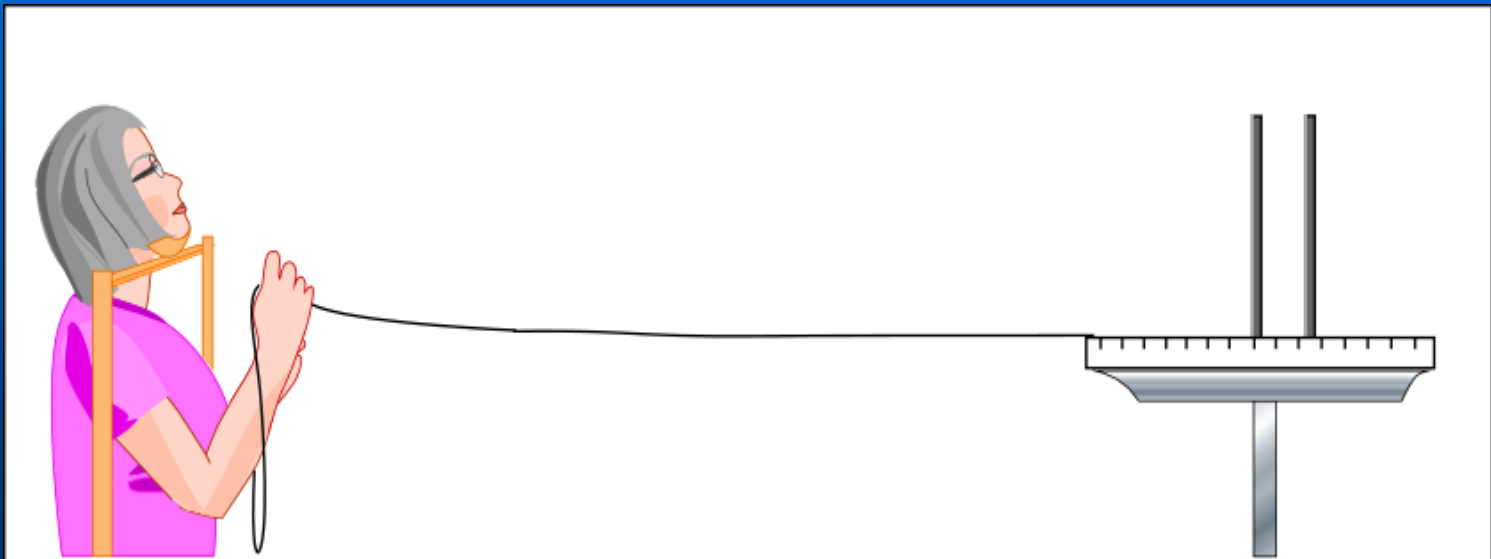
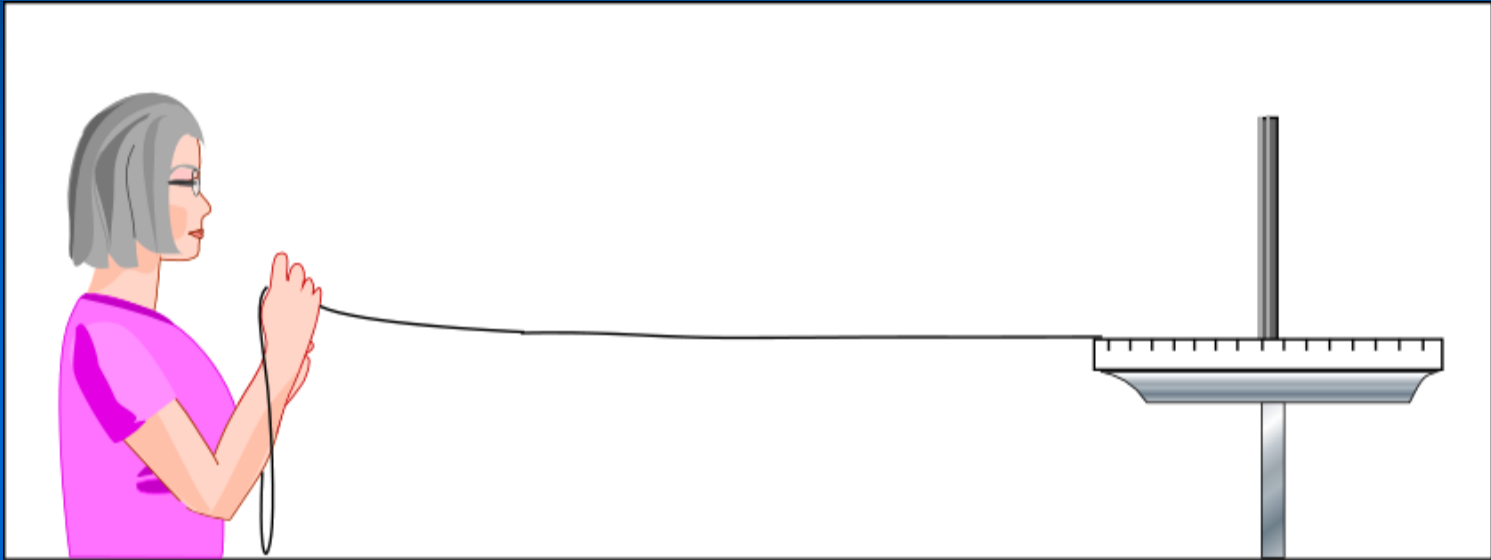
# Contrast Sensitivity

– upper and lower lens vision



# Depth Perception

- upper and lower lens vision



# Control Group (n=301)

- ▶ Optometry Assessment
- ▶ Updated multifocals if required (n = 30, 10.0%)
- ▶ Blinded compliance measurement
- ▶ Usual care

# Glasses Provision & Counselling

- ▶ Single lens glasses provided to 90% of participants within 2 months; median = 28 days, IQR = 19-43 days
- ▶ 35 participants received additional counselling including:
  - ▶ follow-up telephone calls (n=24)
  - ▶ replacement glasses (n=8)
  - ▶ additional cords, glasses case, reminder cards or “glasses use” information leaflets (n=8)
  - ▶ counselling session with optometrists (n=3)

# Compliance

- ▶ Wearing single lens glasses when outside most or all of the time

Number of months	N (%)
0-3	96 (32.1)
4-6	41 (13.7)
7-9	40 (13.3)
10-12	122 (40.8)
Median (IQR)	7 months (2-11 months)

# Falls

	Intervention Rate (SD)	Control Rate (SD)	IRR (95% CI)
Total	1.54 (2.40)	1.66 (3.04)	0.92 (0.73-1.16)
AAP – insiders N=342	1.82 (2.75)	1.36 (1.68)	1.29 (0.97-1.72)
AAP – outsiders N=264	1.26 (1.96)	2.16 (4.41)	0.60 (0.42-0.87)
Interaction			0.47 (0.30-0.74)



# Conclusions

- ▶ Overall, the intervention resulted in an 8% reduction in all falls - a non-significant reduction
- ▶ Sub-group analysis revealed the intervention was effective in preventing falls in people who undertook more outside activities – there was a 40% falls reduction in this group
- ▶ These findings suggest that the provision of single lens glasses for older people who take part in regular outdoor activities is a simple and effective falls prevention strategy

# **The Winchester falls project: a randomised controlled trial of secondary prevention of falls in older people\***

CLAIRE L. SPICE<sup>1</sup>, WENDY MOROTTI<sup>2</sup>, STEVE GEORGE<sup>3</sup>, THOMAS H. S. DENT<sup>4</sup>,  
JIM ROSE<sup>5</sup>, SCOTT HARRIS<sup>6</sup>, CHRISTOPHER J. GORDON<sup>7</sup>

## **Objective**

- ▶ To determine the effectiveness of two interventions, one based in primary care and the other in secondary care, in preventing further falls in recurrent fallers

# Design

- ▶ Cluster randomised trial – by general practice

# Participants

- ▶ 65 years and over, living in the Mid Hampshire UK community
- ▶ Two or more falls in the previous year
- ▶ Not presenting to an emergency department with index fall

# Intervention

- ▶ 18 general practices were randomly allocated to one of three groups
  - ▶ The primary care group were assessed by nurses in the community, using a risk factor review and subsequent targeted referral to other professionals
  - ▶ The secondary care group received a multi-disciplinary in a day hospital followed by identified appropriate interventions
  - ▶ The control group with usual care
- ▶ Follow-up for one year

# Flow of participants through the study

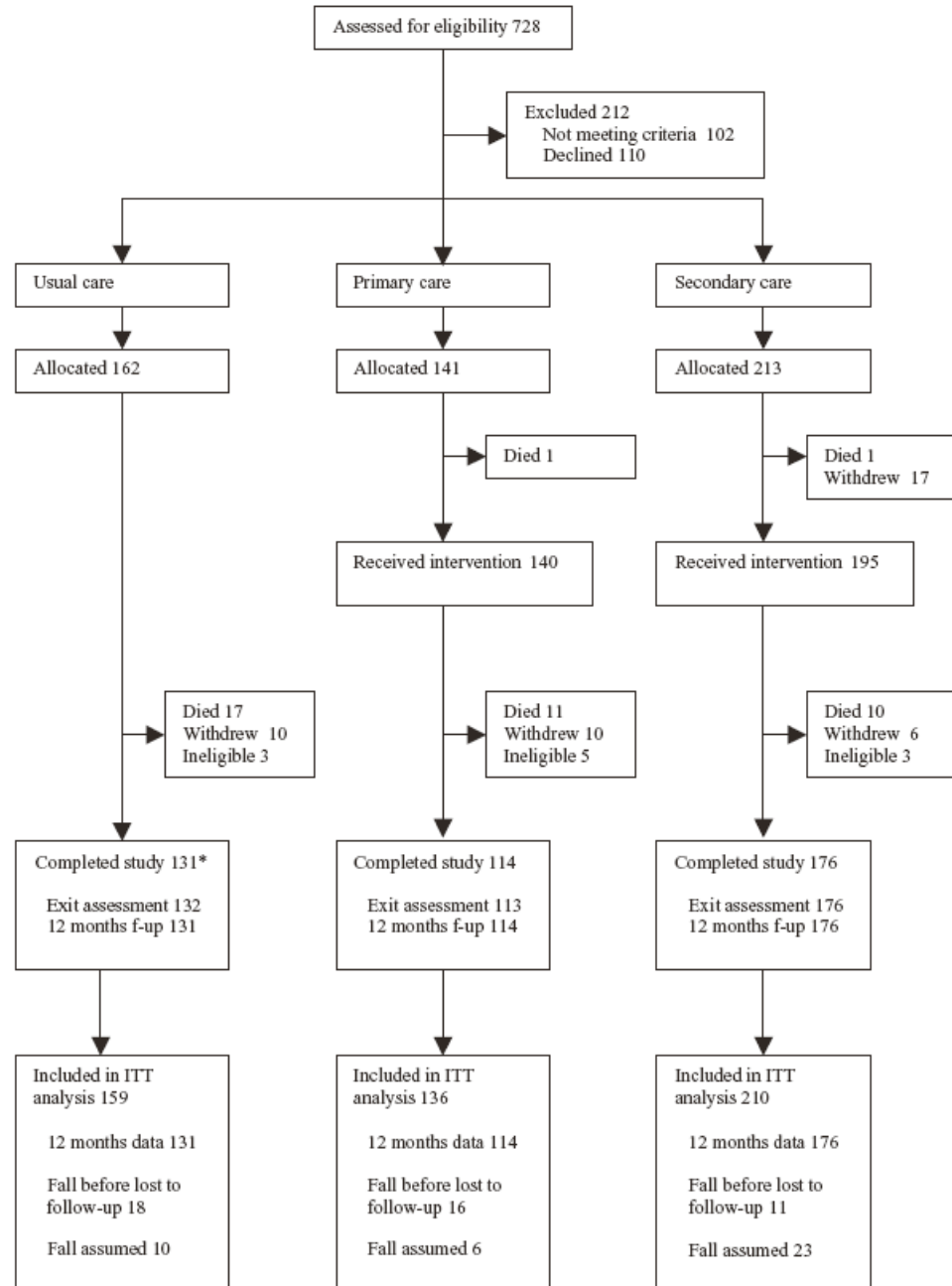


Figure 1. Trial profile for participants. \*1 participant who did not withdraw and did an exit assessment but did not return the 12<sup>th</sup> month of data is missing so is classified as not completing the study.

# Results

- ▶ 505 participants recruited
- ▶ Follow-up was completed in 83% (420/505)
- ▶ Proportion of participants who fell again was significantly lower in the secondary care group compared to the control group : (75% vs. 84% , OR=0.52, 95%CI=0.35-0.79)
- ▶ The primary care group showed similar results to the control group (87% OR=1.17, 95%CI=0.57-2.37)

# Intervention differences- 2° vs 1°

- ▶ Multidisciplinary vs. nurse assessment
- ▶ 121 minutes vs. 71 minutes
- ▶ Referral usually to GP in primary group with few reviewed by a geriatrician or at a falls clinic
- ▶ Proportion with medication changes: 52% VS.16%
- ▶ Hypnotic/sedative medication use increased in primary care and usual care groups at end of study

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## Key points

- Falls in older people often have multifactorial causes.
  - Recurrent fallers are at an increased risk of functional decline and institutionalisation.
  - Multifactorial interventions can reduce falls but the benefit of different ways of delivering such interventions is not clear.
  - This study demonstrates that some recurrent fallers can be prevented from falling again.
  - A nurse-led risk factor assessment with targeted referrals did not reduce falls.
  - A structured multi-disciplinary assessment and intervention can reduce falls.
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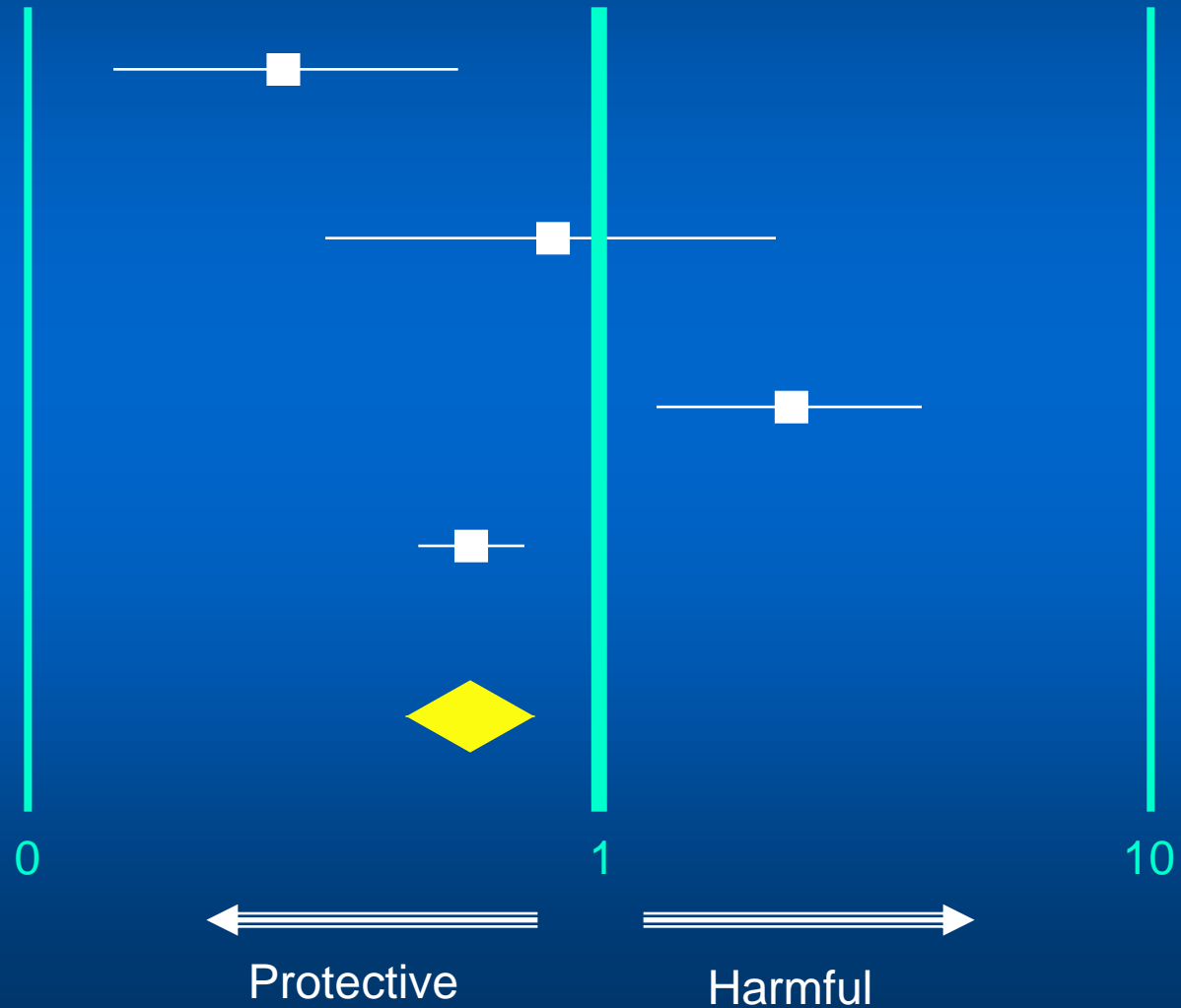
## **Interventions for preventing falls in older people living in the community**

Gillespie LD, Robertson MC, Gillespie WJ, Lamb SE, Gates S, Cumming  
RG, Rowe BH

**111 randomised controlled trials**

<http://www.cochrane.org/reviews/en/ab007146.html>

# A forest plot



# Group Exercise

s control, Outcome 1 Rate of falls, Subgroup 1 Group exercise: multiple components vs control.

Review: Interventions for preventing falls in older people living in the community  
 Comparison: 1 Exercise vs control  
 Outcome: 1 Rate of falls

Study or subgroup	Intervention N	Control N	log [Rate ratio] (SE)	Rate ratio IV,Fixed,95% CI	Weight	Rate ratio IV,Fixed,95% CI
<b>1 Group exercise: multiple components vs control</b>						
Ballard 2004	20	19	-0.97 (0.59)		0.7 %	0.38 [ 0.12, 1.20 ]
Barnett 2003	76	74	-0.51 (0.26)		3.5 %	0.60 [ 0.36, 1.00 ]
Buchner 1997a	70	30	-0.49 (0.22)		4.8 %	0.61 [ 0.40, 0.94 ]
Bunout 2005	111	130	0.2 (0.29)		2.8 %	1.22 [ 0.69, 2.16 ]
Carter 2002	40	40	-0.13 (0.52)		0.9 %	0.88 [ 0.32, 2.43 ]
Korpelainen 2006	84	76	-0.24 (0.15)		10.4 %	0.79 [ 0.59, 1.06 ]
Lord 1995	75	94	-0.16 (0.2)		5.9 %	0.85 [ 0.58, 1.26 ]
Lord 2003	259	249	-0.25 (0.12)		16.3 %	0.78 [ 0.62, 0.99 ]
Luukinen 2007	217	220	-0.07 (0.08)		36.6 %	0.93 [ 0.80, 1.09 ]
Means 2005	144	94	-0.89 (0.21)		5.3 %	0.41 [ 0.27, 0.62 ]
Rubenstein 2000	31	28	-0.17 (0.39)		1.5 %	0.84 [ 0.39, 1.81 ]
Skelton 2005	50	31	-0.37 (0.17)		8.1 %	0.69 [ 0.50, 0.96 ]
Suzuki 2004	22	22	-1.05 (0.47)		1.1 %	0.35 [ 0.14, 0.88 ]
Weerdesteyn 2006	30	28	-0.63 (0.32)		2.3 %	0.53 [ 0.28, 1.00 ]
<b>Subtotal (95% CI)</b>					<b>100.0 %</b>	<b>0.78 [ 0.71, 0.86 ]</b>

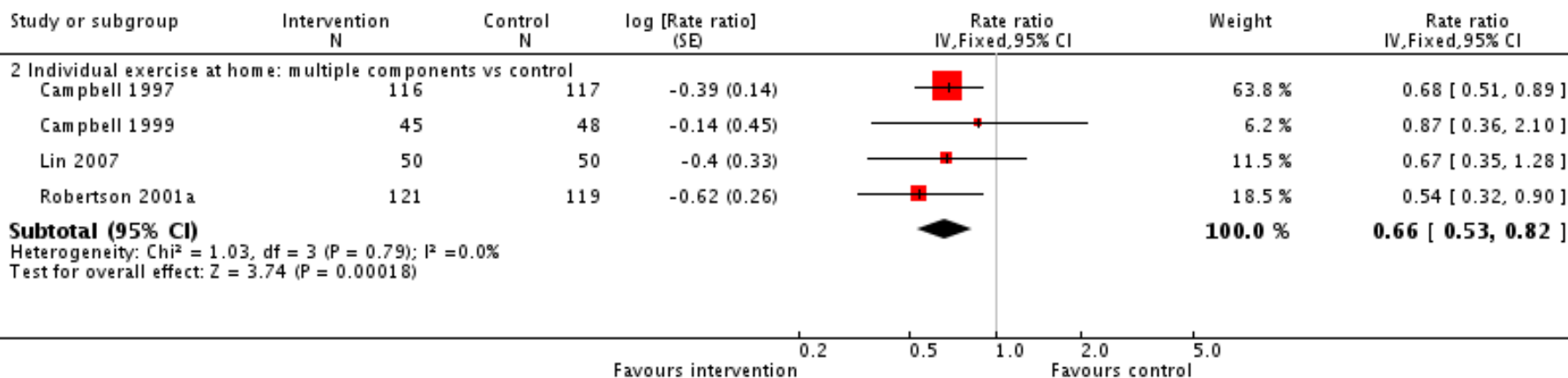
Heterogeneity:  $\text{Chi}^2 = 25.55$ ,  $\text{df} = 13$  ( $P = 0.02$ );  $I^2 = 49\%$   
 Test for overall effect:  $Z = 5.15$  ( $P < 0.00001$ )

0.2 0.5 1.0 2.0 5.0  
 Favours intervention Favours control

# Individual Home Exercise

1 Exercise vs control, Outcome 1 Rate of falls, Subgroup 2 Individual exercise at home: multiple components vs control.

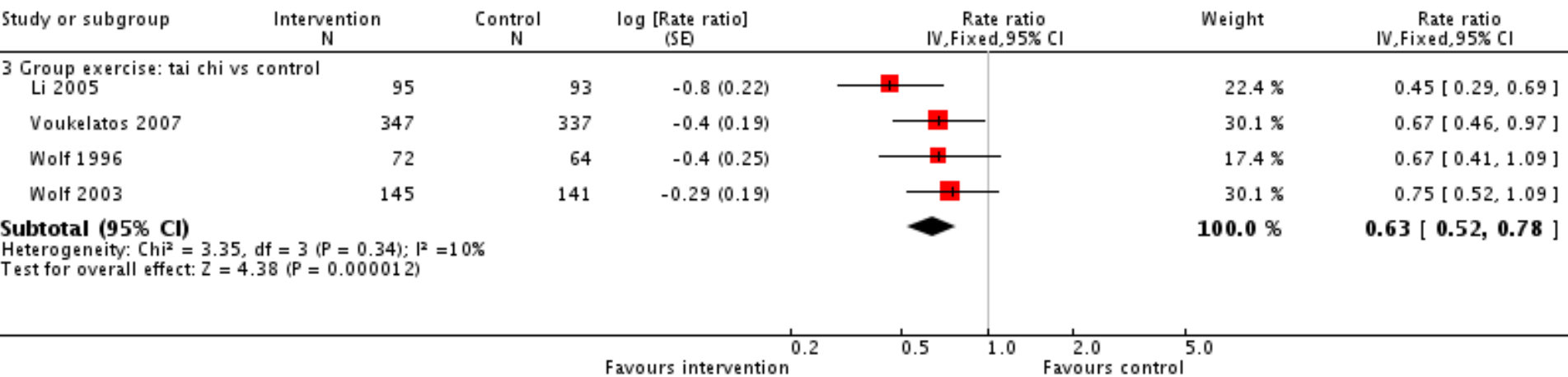
Review: Interventions for preventing falls in older people living in the community  
 Comparison: 1 Exercise vs control  
 Outcome: 1 Rate of falls



# Tai Chi

control, Outcome 1 Rate of falls, Subgroup 3 Group exercise: tai chi vs control.

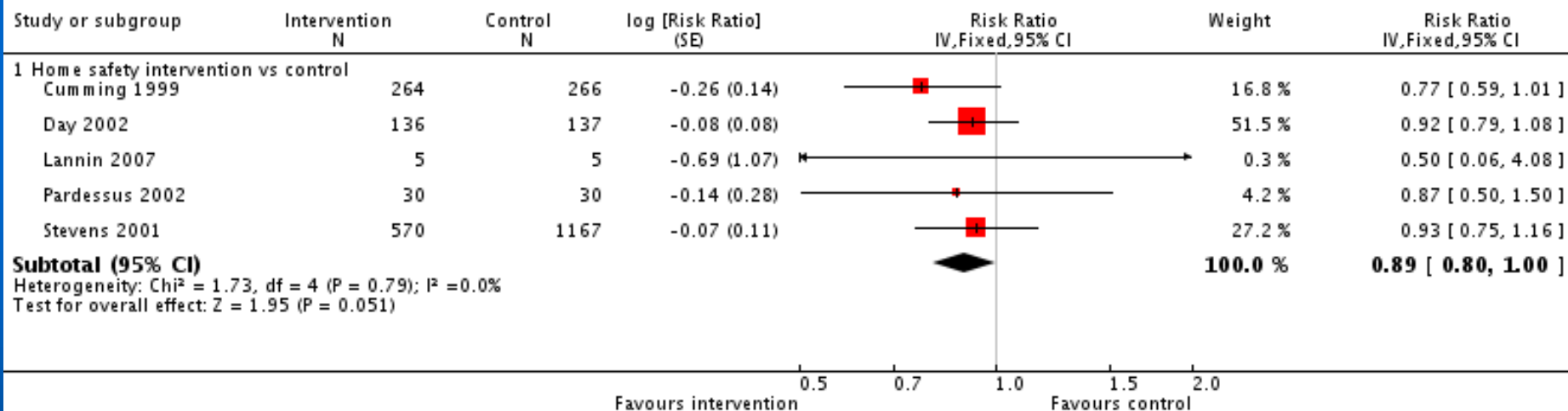
Review: Interventions for preventing falls in older people living in the community  
 Comparison: 1 Exercise vs control  
 Outcome: 1 Rate of falls



# Home Safety Interventions

Interventions vs control, Outcome 2 Number of fallers, Subgroup 1 Home safety intervention vs control.

Review: Interventions for preventing falls in older people living in the community  
 Comparison: 12 Environmental/assistive technology interventions vs control  
 Outcome: 2 Number of fallers



# Multifaceted Interventions

Review: Interventions for preventing falls in older people living in the community  
 Comparison: 16 Multifactorial intervention after assessment vs control  
 Outcome: 1 Rate of falls

Study or subgroup	Intervention N	Control N	log [Rate ratio] (SE)	Rate ratio IV,Random,95% CI	Weight	Rate ratio IV,Random,95% CI
Carpenter 1990	181	186	-1.08 (0.33)		3.0 %	0.34 [ 0.18, 0.65 ]
Close 1999	141	163	-0.89 (0.09)		7.8 %	0.41 [ 0.34, 0.49 ]
Davison 2005	144	149	-0.45 (0.17)		5.9 %	0.64 [ 0.46, 0.89 ]
Elley 2008	155	157	-0.04 (0.17)		5.9 %	0.96 [ 0.69, 1.34 ]
Gallagher 1996	50	50	-0.21 (0.15)		6.4 %	0.81 [ 0.60, 1.09 ]
Hogan 2001	75	77	-0.3 (0.09)		7.8 %	0.74 [ 0.62, 0.88 ]
Hornbrook 1994	1611	1571	-0.17 (0.03)		8.8 %	0.84 [ 0.80, 0.89 ]
Lightbody 2002	155	159	-0.16 (0.11)		7.4 %	0.85 [ 0.69, 1.06 ]
Lord 2005	396	201	-0.03 (0.09)		7.8 %	0.97 [ 0.81, 1.16 ]
Mahoney 2007	174	175	-0.21 (0.18)		5.7 %	0.81 [ 0.57, 1.15 ]
Nikolaus 2003	181	179	-0.37 (0.16)		6.2 %	0.69 [ 0.50, 0.95 ]
Rubenstein 2007	327	352	0.17 (0.14)		6.6 %	1.19 [ 0.90, 1.56 ]
Salminen 2008	292	297	-0.08 (0.09)		7.8 %	0.92 [ 0.77, 1.10 ]
Tinetti 1994	147	144	-0.58 (0.15)		6.4 %	0.56 [ 0.42, 0.75 ]
Wyman 2005	126	126	-0.33 (0.15)		6.4 %	0.72 [ 0.54, 0.96 ]

**Total (95% CI)**

Heterogeneity:  $\tau^2 = 0.06$ ;  $\chi^2 = 90.82$ ,  $df = 14$  ( $P < 0.00001$ );  $I^2 = 85\%$   
 Test for overall effect:  $Z = 4.03$  ( $P = 0.000057$ )

**100.0 %**      **0.75 [ 0.65, 0.86 ]**

0.2      0.5      1.0      2.0      5.0  
 Favours intervention      Favours control

# Implications – exercise

## ▶ Exercise

- ▶ Overall, exercise is an effective intervention to reduce the risk and rate of falls
- ▶ Three different approaches to exercise appear to have significant beneficial effects
- ▶ Multiple-component and Tai Chi as group exercise reduces rate of falls and risk of falling
- ▶ Individually prescribed exercise carried out at home reduces rate of falls and risk of falling, but there is no evidence to support this intervention in people with severe visual impairment or mobility problems after a stroke, Parkinson's disease or after a hip fracture



# Implications - medications

- ▶ Medication interventions
  - ▶ Limited evidence for the effectiveness of interventions targeting medications
  - ▶ Vitamin D does not appear to be an effective intervention for preventing falls in older people living in the community, although there is provisional evidence that it may reduce falls risk in people with low Vitamin D levels

# Implications - environment

- ▶ Environmental assessment and intervention
  - ▶ Home safety interventions do not appear to reduce falls or risk of falling
  - ▶ Evidence so far published is relatively limited, people at high risk of falling may benefit
  - ▶ An anti-slip shoe device for icy conditions significantly reduced winter outside falls in one study

# Implications - multifactorial

- ▶ Multifactorial interventions
  - ▶ Integrating assessment with individual interventions, usually involving a multi-professional team, are effective in reducing rate of falls but not risk of falling
  - ▶ No evidence that assessment and intervention is more effective than assessment and referral, or that multifactorial interventions are more effective in participants selected as being at higher risk of falling