



Effects of a risk-based multifactorial fall prevention programme on the incidence of falls

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Aims of the study

- To evaluate the effects of the programme on
 - falls
 - injurious falls
 - falls resulting in a major injury
 - falls requiring medical treatment
 - falls leading to hospital admissions
 - and to identify the subgroups that benefit the most



Methods

- Subjects
 - community-dwelling elderly who participated in the multifactorial risk-based fall prevention trial
 - The inclusion criteria
 - age ≥ 65 years
 - at least one fall during the previous 12 months
 - MMSE ≥ 17
 - able to walk 10 meters independently
 - living at home or in sheltered housing
 - 591 participants
 - 293 in the intervention group (IG)
 - 298 in the control group (CG)



■ A fall

- an event that results in a person unintentionally coming to rest on the ground, floor, or other lower level with or without loss of consciousness or injury

(Ruberstein et al. Ann Intern Med 1990;113:309–16; Koski et al. Age Ageing 1996;25:29–38)

- traffic accidents and falls while riding a bicycle were excluded

(WHO. ICD-10, 2. edition, 1999)



- Minor injuries
 - lacerations without sutures, bruises, abrasions, and sprains (Nevitt et al. J Gerontol 1991;46:164–70)

- Major injuries
 - joint dislocations, lacerations requiring sutures, fractures, and severe head injuries (e.g. hemorrhages) (Nevitt et al. J Gerontol 1991;46:164–70)

- The most severe injury caused by each incident was taken into account



Fall data

- Falls were recorded by monthly fall diaries
- Falls requiring medical or hospital treatment were verified from the registers
- Fall data from diaries (n=589):
 - 548 completed all fall diaries during the follow-up period of 12 months
 - 41 were followed up until withdrawal
 - 2 were excluded from analyses (no fall diaries returned)
- Fall data from registers (n=591):
 - 584 were followed up for 12 months
 - 7 were followed up until death



Establishment of subgroups

Measurement/ variable	Categories
gender	men vs. women
age	65-74 vs. ≥ 75 years
balance (BBS)	45-56 vs. 0-44
muscle strength (hand grip)	\geq median vs. $<$ median
depressive symptoms (GDS)	0-10 vs. 11-30
self-perceived risk of falling	low vs. high
the number of previous falls	1-2 vs. ≥ 3
the number of prescribed medications	< 4 vs. ≥ 4



- *A 12-month intervention programme*
 - *was based on an individual risk analysis*
 - *consisted of*
 - *a geriatric assessment*
 - *counselling and guidance in fall prevention*
 - *home hazards assessment*
 - *group physical exercise*
 - *home exercise*
 - *lectures in groups*
 - *psychosocial groups*



Results

- Baseline characteristics
 - mean age was 73.5 years in both groups
 - 84% of the participants were women
 - groups were well balanced at baseline



Number of fallers and falls in IG and CG during a 12-month follow-up

	IG (n=292*) n	CG (n=297†) n
Fallers	140	131
Falls	243	271
Injurious falls	116	93
Falls resulting in major injuries	14	12
	(n=293‡) n	(n=298§) n
Falls requiring medical care	52	52
Fall-related hospital admissions	15	11
The mean follow-up times: *353, †354, ‡362, and §364 days		



Incidence of falls and injurious falls in IG and CG and RR for IG compared to CG in Poisson regression analysis among all participants

Falls	Incidence (95% CI)	RR (95% CI)
IG (n=292)	0.86 (0.76-0.98)	0.92 (0.77-1.09)
CG (n=297)	0.94 (0.84-1.06)	1
Injurious falls		
IG (n=292)	0.41 (0.34-0.49)	1.27 (0.97-1.67)
CG (n=297)	0.32 (0.26-0.40)	1



Incidence of falls in IG and CG and RR for IG compared to CG in Poisson regression analysis among subgroups

	Incidence (95% CI)	RR (95% CI)
By age		
65-74 yrs.		
IG (n=178)	0.73 (0.61 - 0.87)	0.77 (0.61 - 0.97)
CG (n=188)	0.95 (0.82 - 1.10)	1
By muscle strength		
≥median		
IG (n=141)	0.67 (0.54 - 0.82)	0.71 (0.55 - 0.92)
CG (n=150)	0.94 (0.79 - 1.11)	1
By previous falls		
≥3		
IG (n=177)	0.97 (0.79 - 1.21)	0.58 (0.44 - 0.76)
CG (n=172)	1.68 (1.42 - 1.98)	1
By self-perceived risk of falling		
High		
IG (n=148)	1.02 (0.86 - 1.20)	0.76 (0.61 - 0.94)
CG (n=149)	1.34 (1.16 - 1.54)	1

	Incidence (95% CI)	RR (95% CI)
By depressive symptoms		
≥11 in GDS		
IG (n=52)	0.72 (0.51 - 1.01)	0.48 (0.32 - 0.73)
CG (n=46)	1.50 (1.17 - 1.91)	1
By prescribed medications		
≥4		
IG (n=161)	1.00 (0.85 - 1.17)	0.77 (0.62 - 0.96)
CG (n=132)	1.30 (1.11 - 1.51)	1



Incidence of injurious falls in IG and CG and RR for IG compared to CG in Poisson regression analysis among subgroups

	Incidence (95% CI)	RR (95% CI)
By depressive symptoms		
0-10 in GDS		
IG (n=233)	0.42 (0.34 - 0.51)	1.44 (1.05 - 1.97)
CG (n=242)	0.29 (0.23 - 0.37)	1
By self-perceived risk of falling		
Low		
IG (n=141)	0.36 (0.27 - 0.48)	1.86 (1.17 - 2.96)
CG (n=148)	0.19 (0.13 - 0.28)	1
By previous falls		
1-2		
IG (n=115)	0.42 (0.34 - 0.52)	1.72 (1.21 - 2.45)
CG (n=125)	0.25 (0.19 - 0.32)	1
By medications		
<4		
IG (n=131)	0.40 (0.30 - 0.52)	1.67 (1.10 - 2.54)
CG (n=165)	0.24 (0.17 - 0.33)	1



- No significant differences between IG and CG in the incidences of falls
 - resulting in major injuries
 - requiring medical treatment
 - fall-related hospital admissions

- 5% of falls caused a major injury

- 2 hip fractures occurred during the 12-month intervention period (1 in IG and 1 in CG)



Discussion

- The incidence of falls reduced among those with a higher level of muscle strength and among younger (65–74 yrs.) participants
 - better adherence to physical exercise groups
(Sjösten et al. Eur J Public health 2007;17:464-70)
 - the improvements in muscle strength
(Salminen et al. Aging Clin Exp Res 2007. In press)
 - muscle strength exercises performed mostly in standing position which might have favoured those with better physical functional abilities



- The incidence of falls reduced among those with higher amount of depressive symptoms
 - special attention was focused on depressive persons, and the depressive symptoms reduced during the intervention (Sjösten et al. Int J Geriatr Psychiatry. 2007 Oct 12; [Epub ahead of print])
 - activation of exercising → improved physical functioning



- The incidence of falls decreased among those with ≥ 4 medications
 - an individual geriatric assessment included a reduction of fall-risk-increasing drugs (psychotropics, opiates, and strongly anticholinergic drugs)
 - the number of regular psychotropics users decreased significantly and that of those using ≥ 4 regular drugs tended to decrease in IG compared to CG
- (Salonoja et al. Personal communication 2008)



- The incidence of falls decreased among those with ≥ 3 previous falls and a high self-perceived risk of falling
 - those falling recurrently usually perceive their risk of falling as being high
 - side-effects of medications?
 - post-fall anxiety syndrome?
(Brown. Physiother Theory Pract 1999;15:59-68)
 - the number of medications may have decreased and self-confidence increased due to the intervention

→ activation of exercising →

improved physical functioning



- the lack of an effect on the incidence of falls among all participants
 - opportunist recruitment
 - inclusion criteria not sufficiently stringent
 - age ≥ 65 years
 - at least one previous fall
 - contamination of the control group



- The incidence of injurious falls increased in IG compared to CG
 - among those with "better health condition"
 - a high physical activity rate is associated with high fall risk
 - the proportion of subjects doing their exercises until they felt breathless and sweating a few or several times a week increased in IG compared to CG



Conclusions

- The incidence of falls could be reduced among those whose risk factor levels decreased
- The incidence of injurious falls increased among those with better physical functioning

