A Brief History of Fall Prevention Research

Professor Stephen Lord

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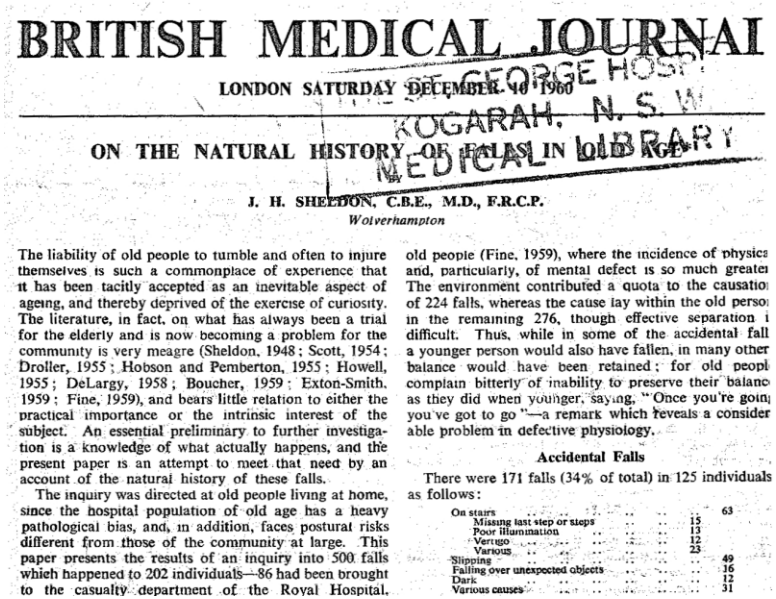
1960 - time zero
Joseph Sheldon – the grandfather of falls



BRITISH MEDICAL JOURNAL

LONDON SATURDAY DECEMBER 10 1960

ON THE NATURAL HISTORY OF FALLS IN OLD AGE

J. H. SHELDON, C.B.E., M.D., F.R.C.P.
Wolverhampton

The liability of old people to tumble and often to injure themselves is such a commonplace of experience that it has been tacitly accepted as an inevitable aspect of ageing, and thereby deprived of the exercise of curiosity. The literature, in fact, on what has always been a trial for the elderly and is now becoming a problem for the community is very meagre (Sheldon, 1948; Scott, 1954; Droller, 1955; Hobson and Pemberton, 1955; Howell, 1955; DeLargy, 1958; Boucher, 1959; Exton-Smith, 1959; Fine, 1959), and bears little relation to either the practical importance or the intrinsic interest of the subject. An essential preliminary to further investigation is a knowledge of what actually happens, and the present paper is an attempt to meet that need by an account of the natural history of these falls.

The inquiry was directed at old people living at home, since the hospital population of old age has a heavy pathological bias, and, in addition, faces postural risks different from those of the community at large. This paper presents the results of an inquiry into 500 falls which happened to 202 individuals—86 had been brought to the casualty department of the Royal Hospital, old people (Fine, 1959), where the incidence of physica and, particularly, of mental defect is so much greate The environment contributed a quota to the causatio of 224 falls, whereas the cause lay within the old perso in the remaining 276, though effective separation i difficult. Thus, while in some of the accidental fall a younger person would also have fallen, in many other balance would have been retained; for old peopl complain bitterly of inability to preserve their balanc as they did when younger, saying, "Once you're goin you've got to go"—a remark which reveals a consider able problem in defective physiology.

Accidental Falls

There were 171 falls (34% of total) in 125 individuals as follows:

On stairs		63
Missing last step or steps	15	
Poor illumination	13	
Vertigo	12	
Various	23	
Slipping		49
Falling over unexpected objects		16
Dark		12
Various causes		31

'The liability of old people to tumble and often injure themselves is such a commonplace of experience that it has been tacitly accepted as an inevitable aspect of ageing and thereby deprived of the exercise of curiosity.'

"The literature on what has always been a trial for the elderly and is now becoming a problem for the community is very meagre"

On the natural history of falls in old age

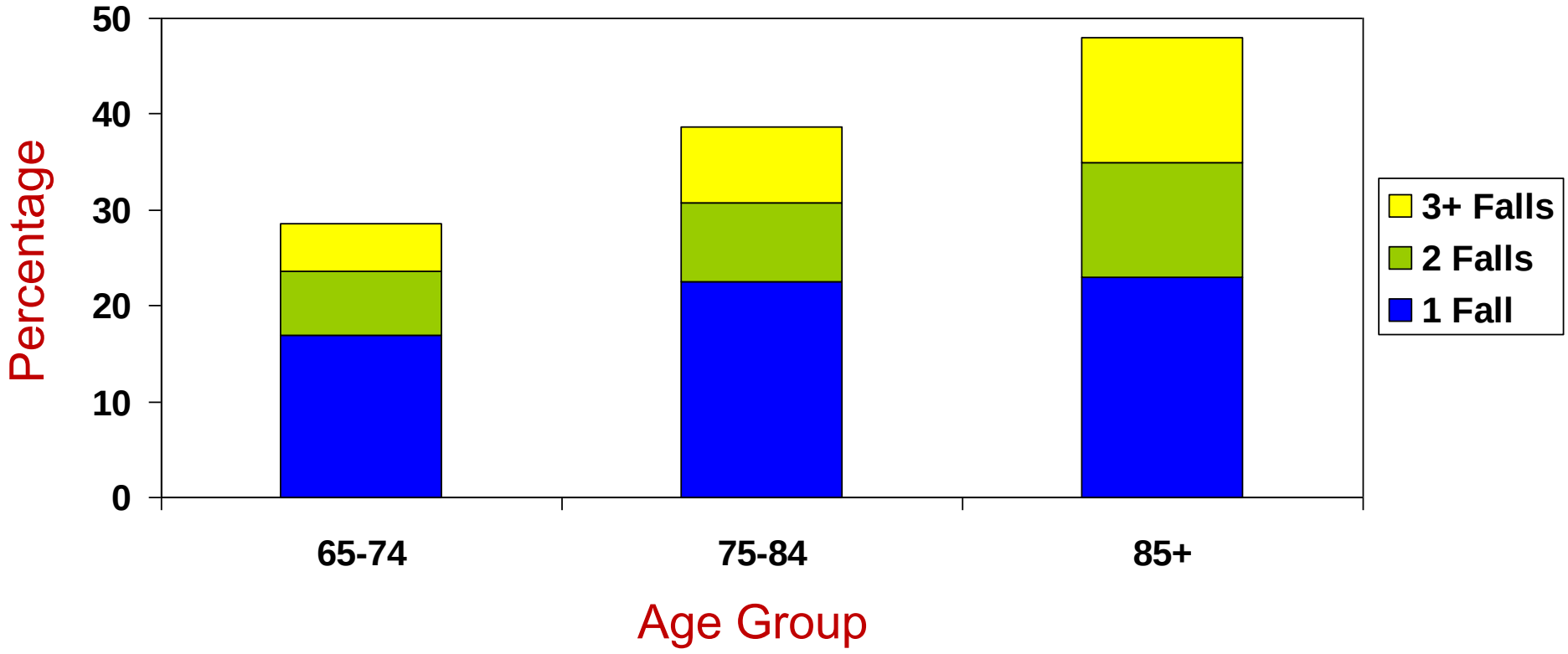
Accidental Falls	171	
Drop Attacks	125	
Trips	53	
Vertigo	37	
Bad Back	20	
Postural Hypotension	18	
Weakness in Leg	16	
Falling out of Bed or Chair	10	
Uncertain	23	
	500	Falls

(J.H. Sheldon BMJ 1960; Dec 10th)

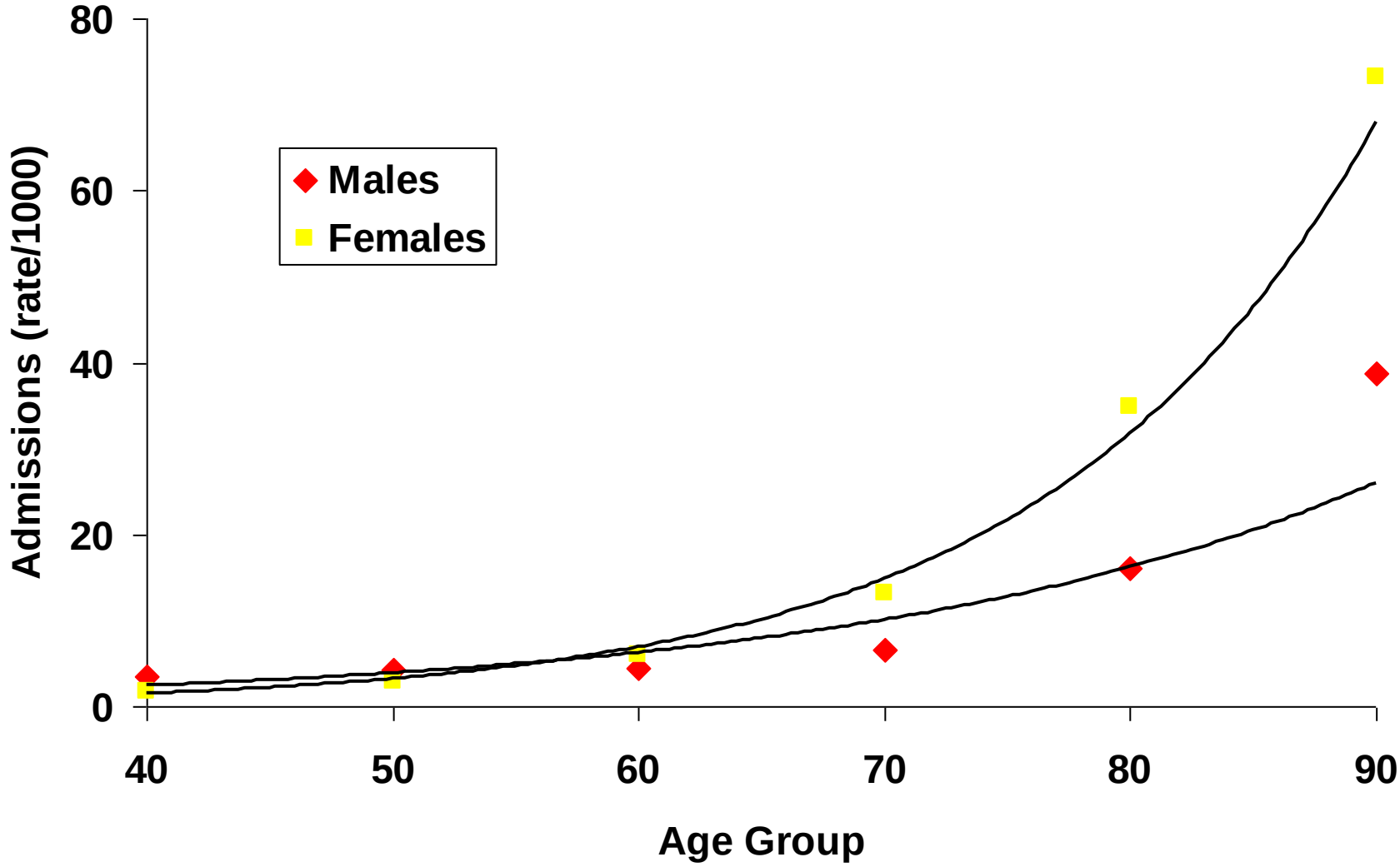
Phase 1: 1977-1988: Initial studies

- Documenting the size of the problem
- Falls risk assessment studies
- Retrospective studies of risk factors
  - Exton-Smith, 1977
  - Overstall, 1977
  - Grimley Evans, 1977, 1981
  - Campbell, 1981
  - Brocklehurst, 1982
  - Isaacs, 1978, 1980, 1981, 1985, 1986
  - Blake, 1988

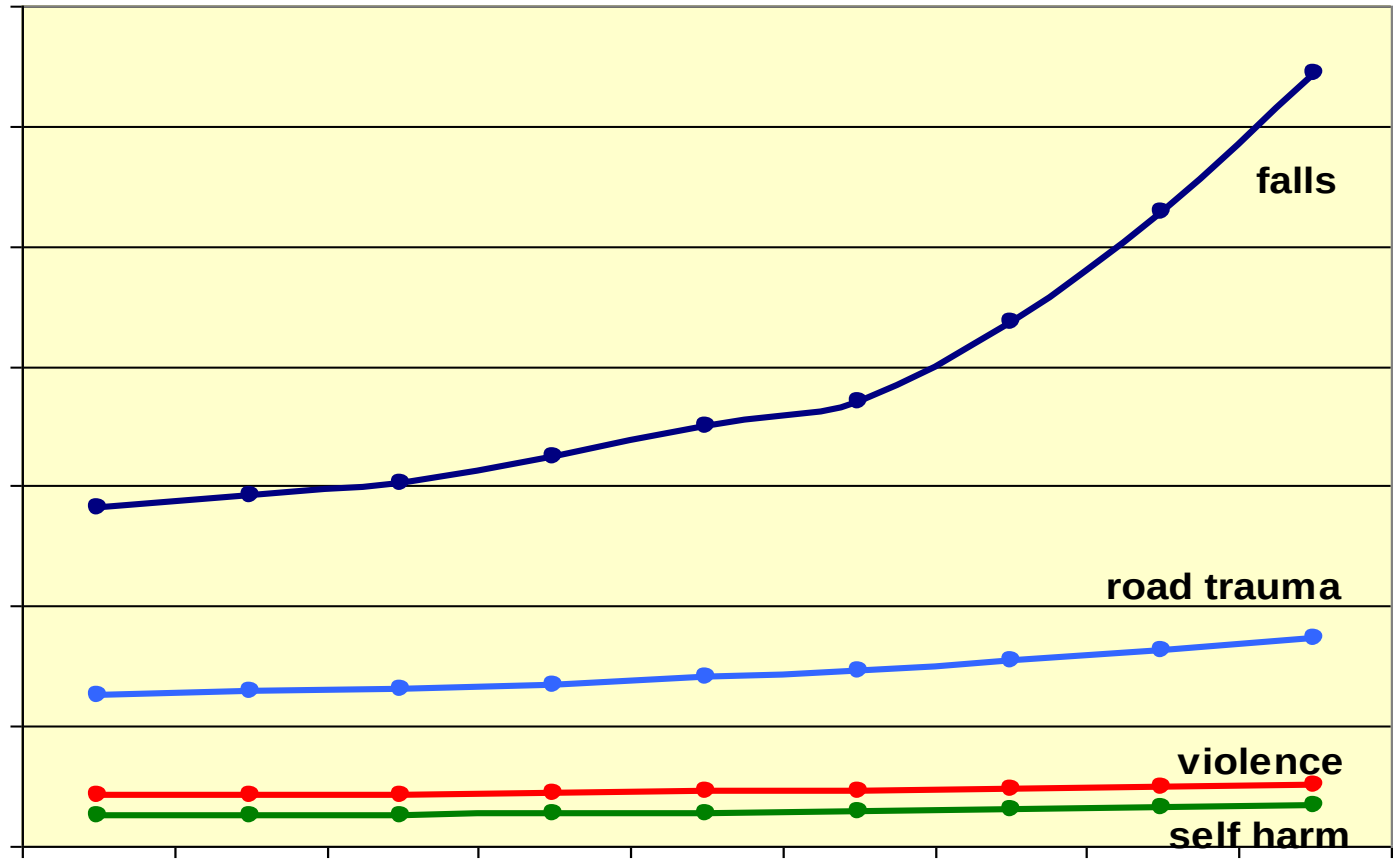
Falls Frequency



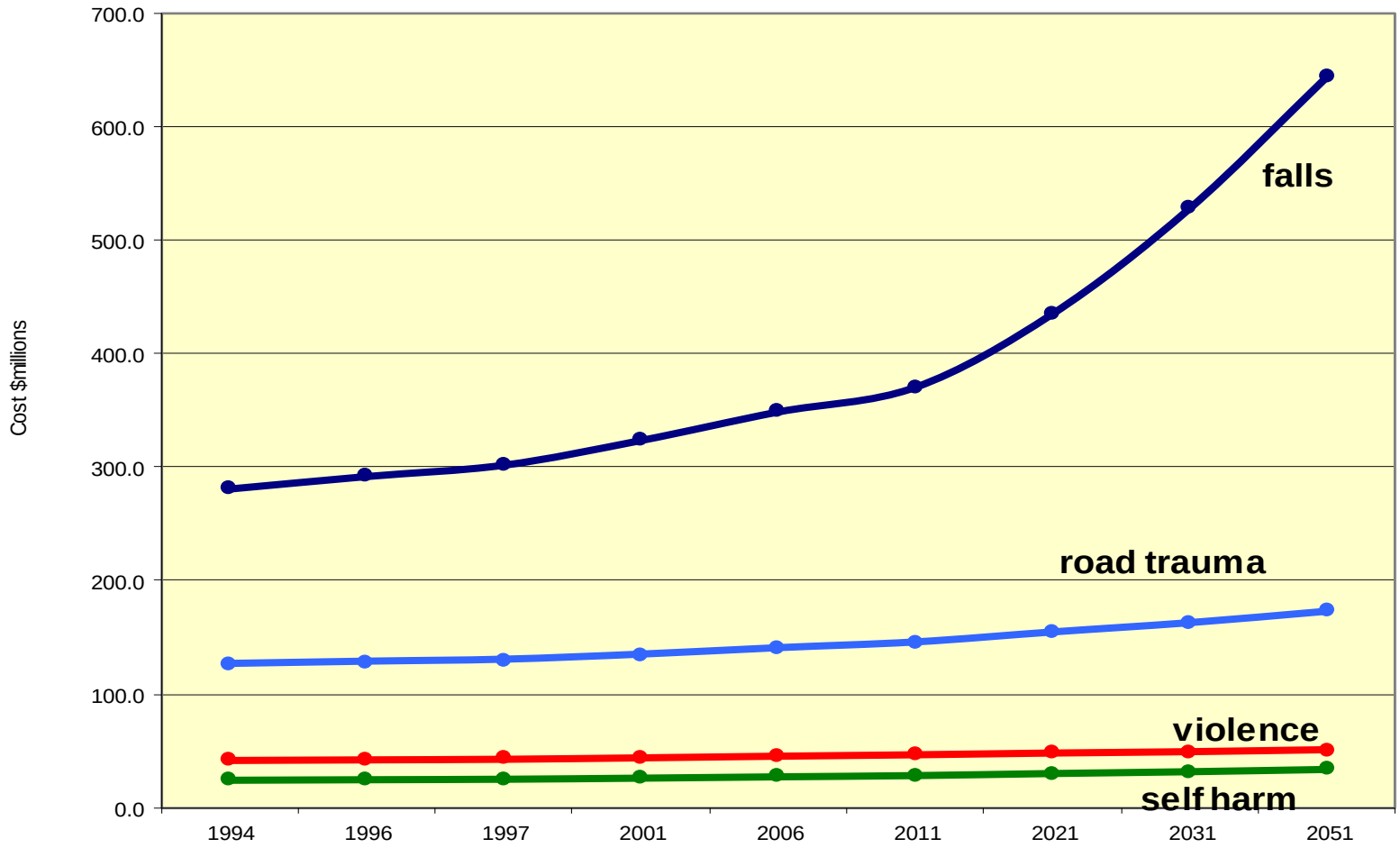
Hospital Admission Rate



Future projections



Future projections



Phase 2: 1988-1995+
Fall risk factor identification

- Large prospective studies
  - Tinetti, 1988
  - Campbell, 1989
  - Nevitt, 1989
  - O'Loughlin, 1993
  - Lord, 1994
  - Luukinen, 1995

Tinetti ME, N Engl J Med; 1998

RISK FACTORS FOR FALLS AMONG ELDERLY PERSONS LIVING IN THE COMMUNITY

MARY E. TINETTI, M.D., MARK SPEECHLEY, PH.D., AND SANDRA F. GINTER, R.N.

Abstract To study risk factors for falling, we conducted a one-year prospective investigation, using a sample of 336 persons at least 75 years of age who were living in the community. All subjects underwent detailed clinical evaluation, including standardized measures of mental status, strength, reflexes, balance, and gait; in addition, we inspected their homes for environmental hazards. Falls and their circumstances were identified during bimonthly telephone calls.

During one year of follow-up, 106 subjects (32 percent) fell at least once; 24 percent of those who fell had serious injuries and 6 percent had fractures. Predisposing factors for falls were identified in linear-logistic models. The adjusted odds ratio for sedative use was 28.3; for cognitive impairment, 5.0; for disability of the lower extremities, 3.8; for palmomental reflex, 3.0; for abnormalities of balance and gait, 1.9; and for foot problems, 1.8; the lower bounds of the 95 percent confidence intervals were 1 or more for all variables. The risk of falling increased linearly with the number of risk factors, from 8 percent with none to 78 percent with four or more risk factors ($P<0.0001$). About 10 percent of the falls occurred during acute illness, 5 percent during hazardous activity, and 44 percent in the presence of environmental hazards.

We conclude that falls among older persons living in the community are common and that a simple clinical assessment can identify the elderly persons who are at the greatest risk of falling. (N Engl J Med 1988; 319:1701-7.)

Campbell AG, J Gerontology; 1989

Journal of Gerontology: MEDICAL SCIENCES
1989, Vol. 44, No. 4, M112–117

Risk Factors for Falls in a Community-Based Prospective Study of People 70 Years and Older

A. John Campbell,[1] Michael J. Borrie,[1] and George F. Spears[2]

[1]Department of Medicine and [2]Department of Social and Preventive Medicine,
University of Otago Medical School, Dunedin, New Zealand.

We investigated factors associated with falls in a community-based prospective study of 761 subjects 70 years and older. The group experienced 507 falls during the year of monitoring. On entry to the study a number of variables had been assessed in each subject. Variables associated with an increased risk of falling differed in men and women. In men, decreased levels of physical activity, stroke, arthritis of the knees, impairment of gait, and increased body sway were associated with an increased risk of falls. In women, the total number of drugs, psychotropic drugs and drugs liable to cause postural hypotension, standing systolic blood pressure of less than 110 mmHg, and evidence of muscle weakness were also associated with an increased risk of falling. Most falls in elderly people are associated with multiple risk factors, many of which are potentially remediable. The possible implications of this in diagnosis and prevention are discussed.

Psychosocial and demographic factors

• Advanced age	***
• Female gender	**
• Living alone	**
• History of falls	***
• Inactivity	**
• ADL limitations	***
• Alcohol consumption	-

Medical factors

• Impaired cognition	***
• Depression	***
• Stroke	***
• Incontinence	**
• Acute illness	**
• Parkinson’s disease	***
• Vestibular disorders	-
• Arthritis	**
• Foot problems	**
• Dizziness	**
• Orthostatic hypotension	*

Medication factors

• Psychoactive medication use	***
• Antihypertensive use	*
• Opioids	**
• NSAIDs	-
• Use of more than 4 medications	***

Psychological factors

- Impaired executive functioning ***
- Reduced processing speed ***
- Impaired selective attention **
- Anxiety **
- Fear of falling ***

Sensory and neuromuscular factors

• Visual acuity	**
• Visual contrast sensitivity	***
• Depth perception	***
• Reduced peripheral sensation	***
• Reduced vestibular function	*
• Muscle weakness	***
• Poor reaction time	***

Balance and mobility factors

- Impaired gait and mobility ***
- Impaired ability in standing up ***
- Impaired ability with transfers ***
- Impaired stability when standing **
- Impaired stability when leaning and reaching **
- Inadequate responses to external perturbations **
- Slow voluntary stepping **

Environmental factors

• Poor footwear	*
• Inappropriate spectacles	**
• Home hazards	**
• External hazards	-

Age and Ageing (1982) *11*, 1–10

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CLINICAL CORRELATES OF SWAY IN OLD AGE—SENSORY MODALITIES

Geront clin. 5: 129–138 (1963)

The Effect of Age on the Control of Sway

By J. H. Sheldon, Wolverhampton

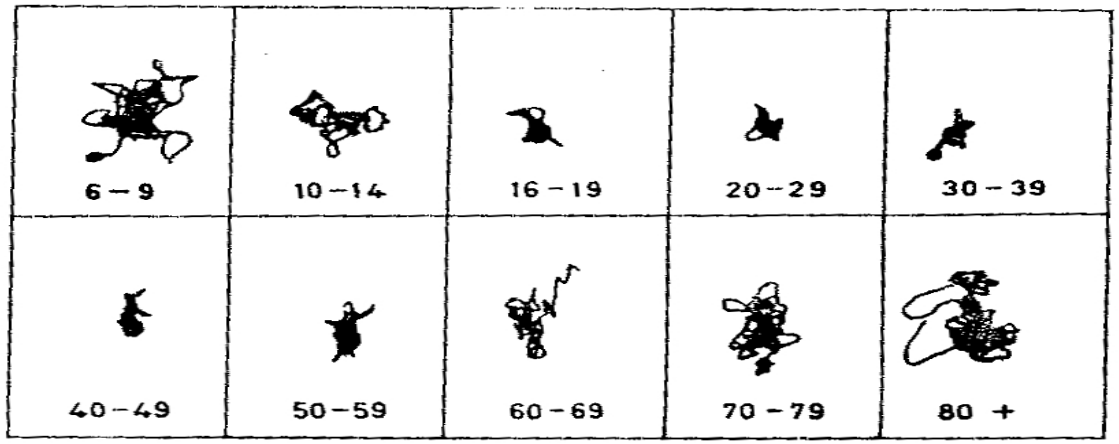


Fig. 1 Typical tracing from each age group in the direct vision/stance test.

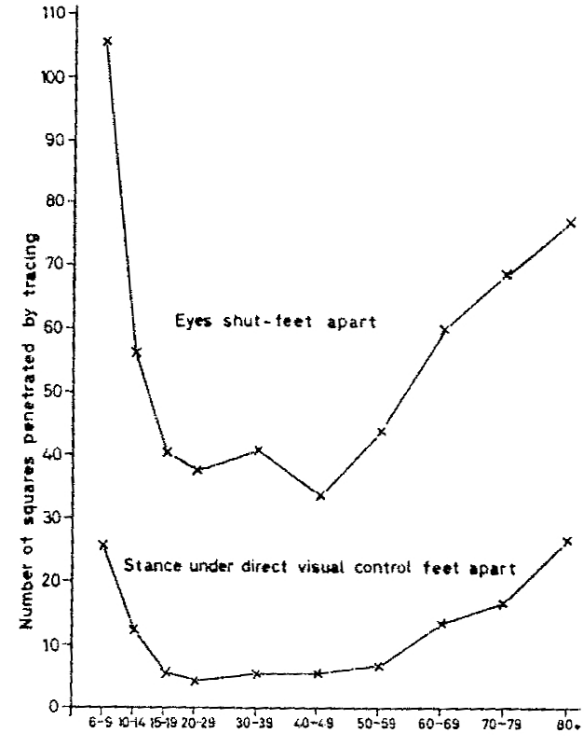
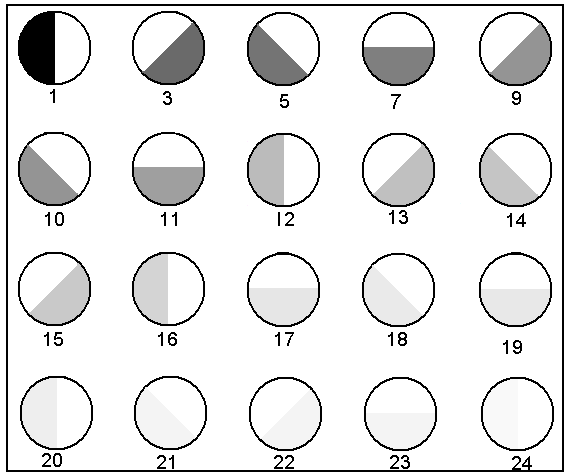
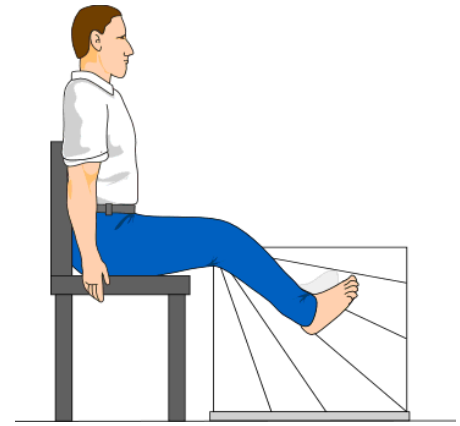
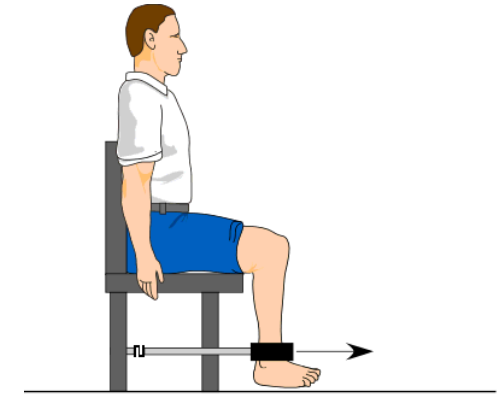


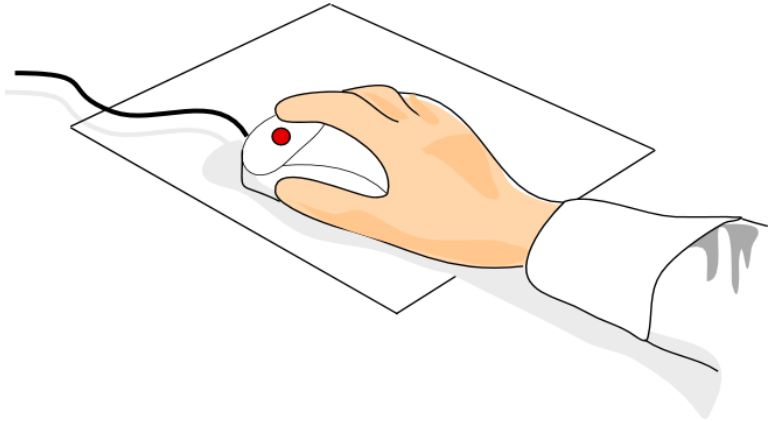
Fig 4

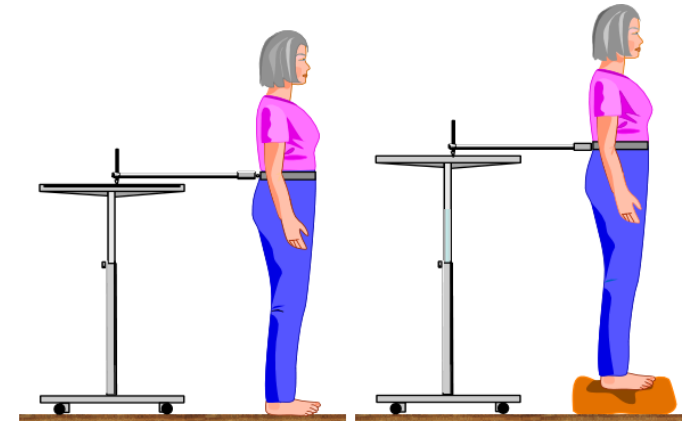
Physiological Profile Assessment







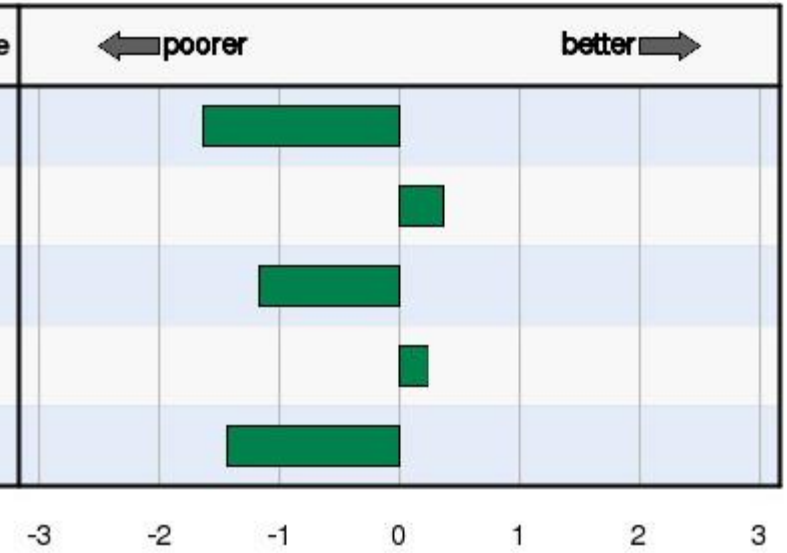




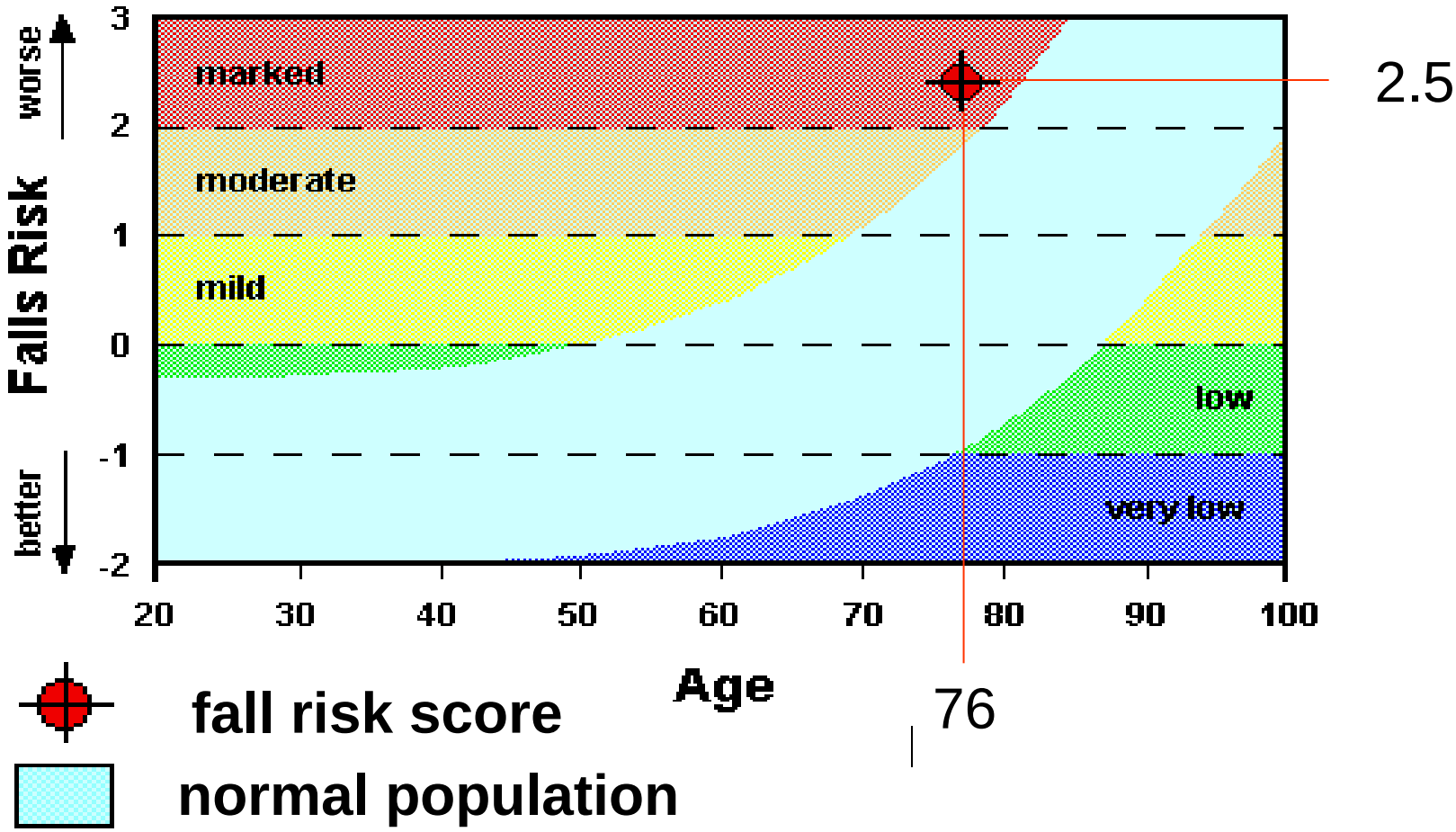
Falls Risk Assessment Z Scores

The green bars show performance in each test in relation to norms for persons aged 65 years and over. Scores above zero show above average performances and scores below zero show below average performances. Scores below -1 indicate significant impairments.

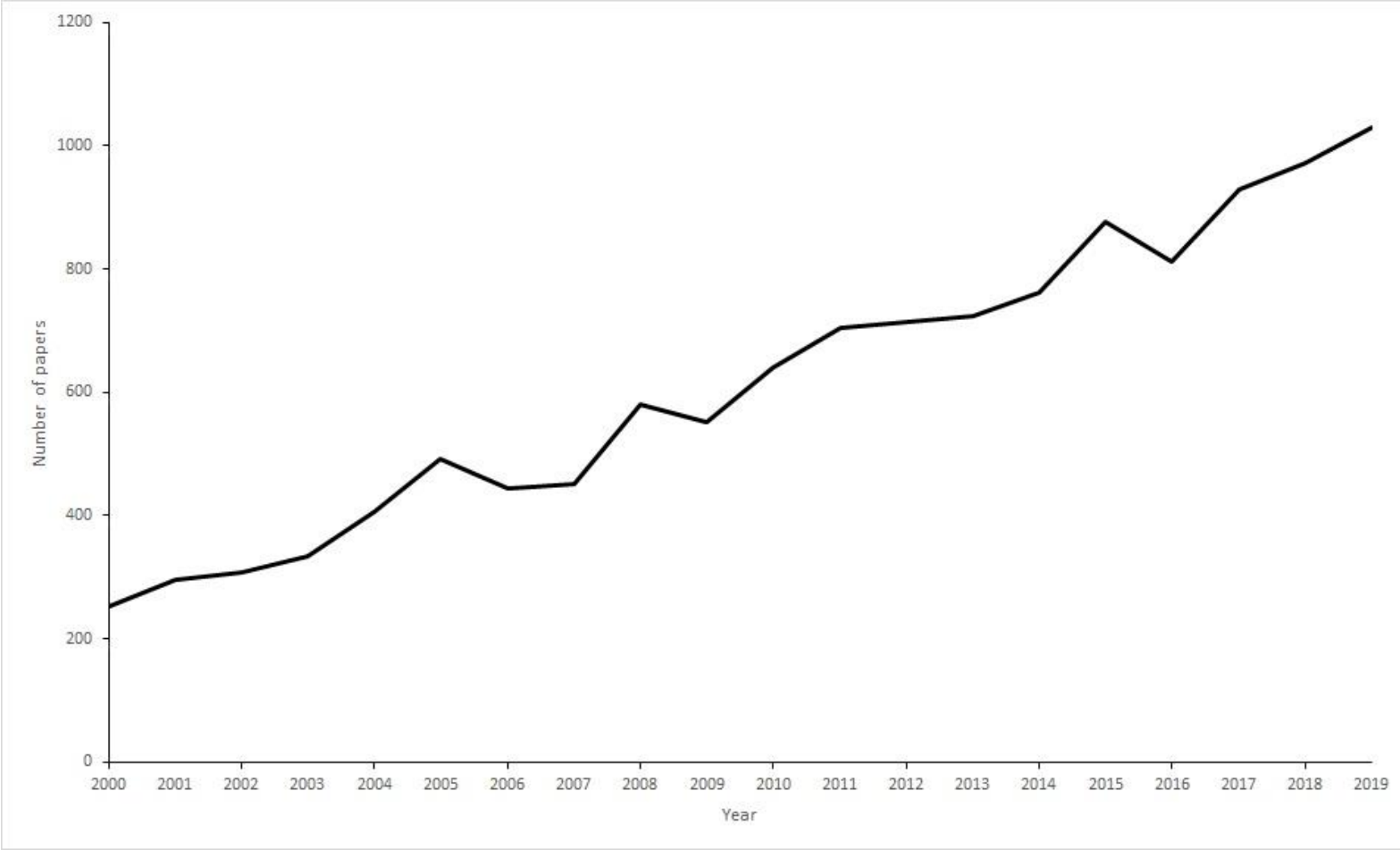
Test	Z-score
Edge contrast sensitivity	-1.63
Proprioception	0.37
Knee extension strength (Right leg)	-1.17
Reaction time (hand)	0.24
Sway on foam eyes open	-1.43



Fall risk score



Phase 3: 1994 – Interventions for preventing falls



Falls publications 2000-2019

Seven early influential fall prevention trials

Multifactorial - community	Tinetti, 1994
Tai Chi - community	Wolf, 1996
Home exercise - community	Campbell, 1997,1999
Multifactorial - care home	Ray, 1997
Multifactorial - ED	Close, 1999
Pacemakers - ED	Kenny, 2001
Cataract surgery - community	Harwood, 2005

Phase 4: 2000 – Synthesizing the findings

- Gillespie LD et al. Interventions for preventing falls in older people living in **the community**. Cochrane Database Syst Rev. 2012 Sep 12;9
- Sherrington C et al. **Exercise for preventing falls in older people living in the community.** Cochrane Database Syst Rev 2019, Issue 1. Art. No.: CD012424. DOI: 10.1002/14651858
- Hopewell S et al. **Interventions based on individual assessment of falls risk and multiple component interventions for preventing falls in older people in the community.** Cochrane Database Syst Rev. 2018, Issue 7. Art. No.: CD012221. DOI: 10.1002/14651858.CD012221.pub2
- Cameron ID et al. **Interventions for preventing falls in older people in care facilities and hospitals**. Cochrane Database Syst Rev. 2018, Issue 9. Art. No.: CD005465. DOI: 10.1002/14651858.CD005465.pub4.

Exercise: a meta analysis

Exercise to prevent falls in older adults: an updated systematic review and meta-analysis

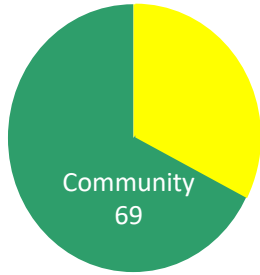
Catherine Sherrington,[1] Zoe A Michaleff,[1,2] Nicola Fairhall,[1] Serene S Paul,[1] Anne Tiedemann,[1] Julie Whitney,[3] Robert G Cumming,[4] Robert D Herbert,[5] Jacqueline C T Close,[5,6] Stephen R Lord[5]

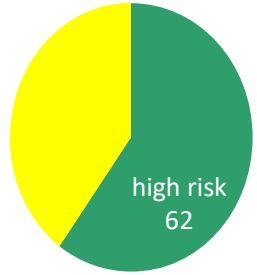
British Journal of Sports Medicine

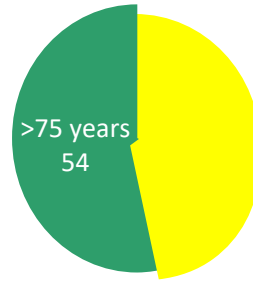
doi:10.1136/bjsports-2016-096547

99 comparisons
(88 trials)

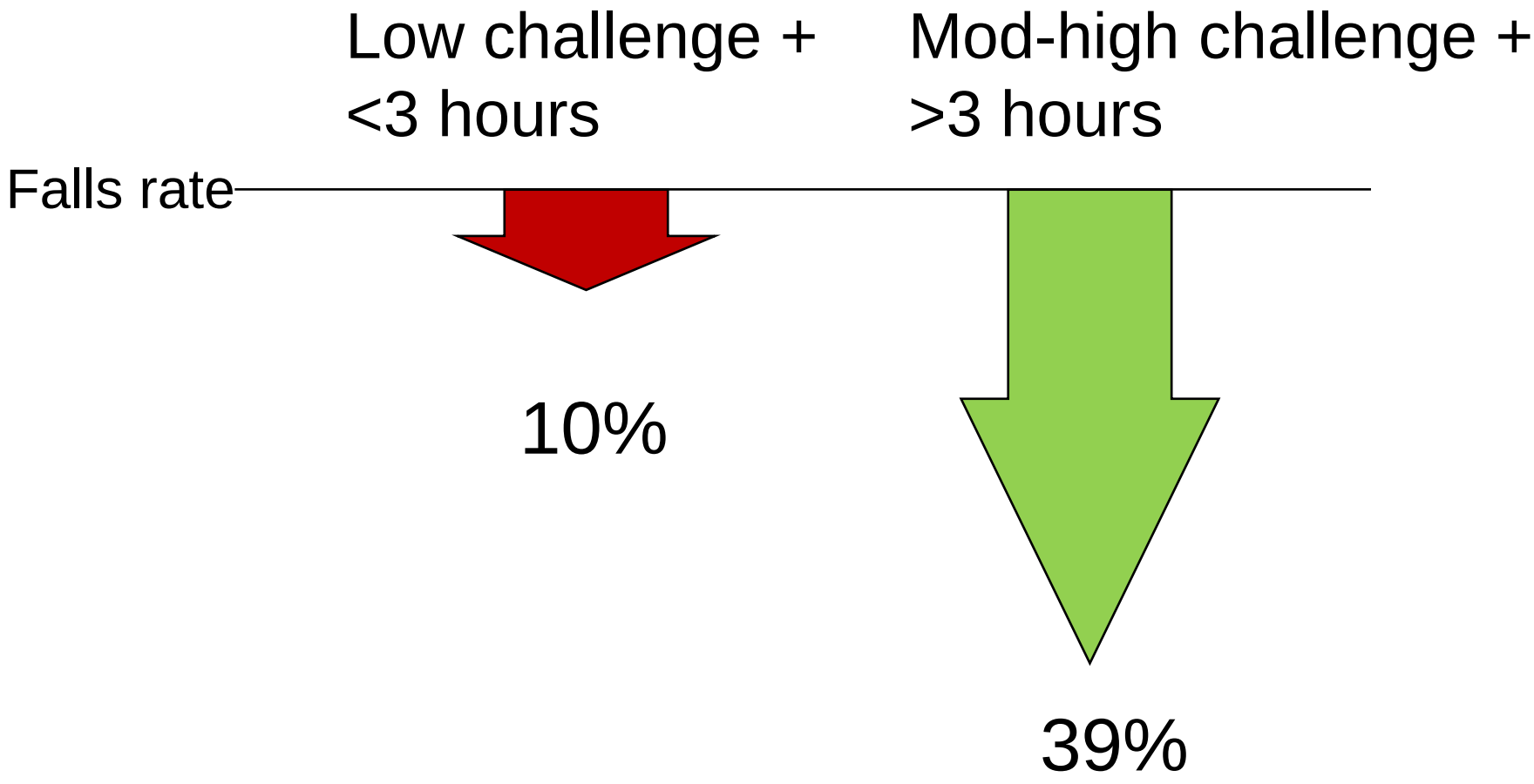
19 478 participants



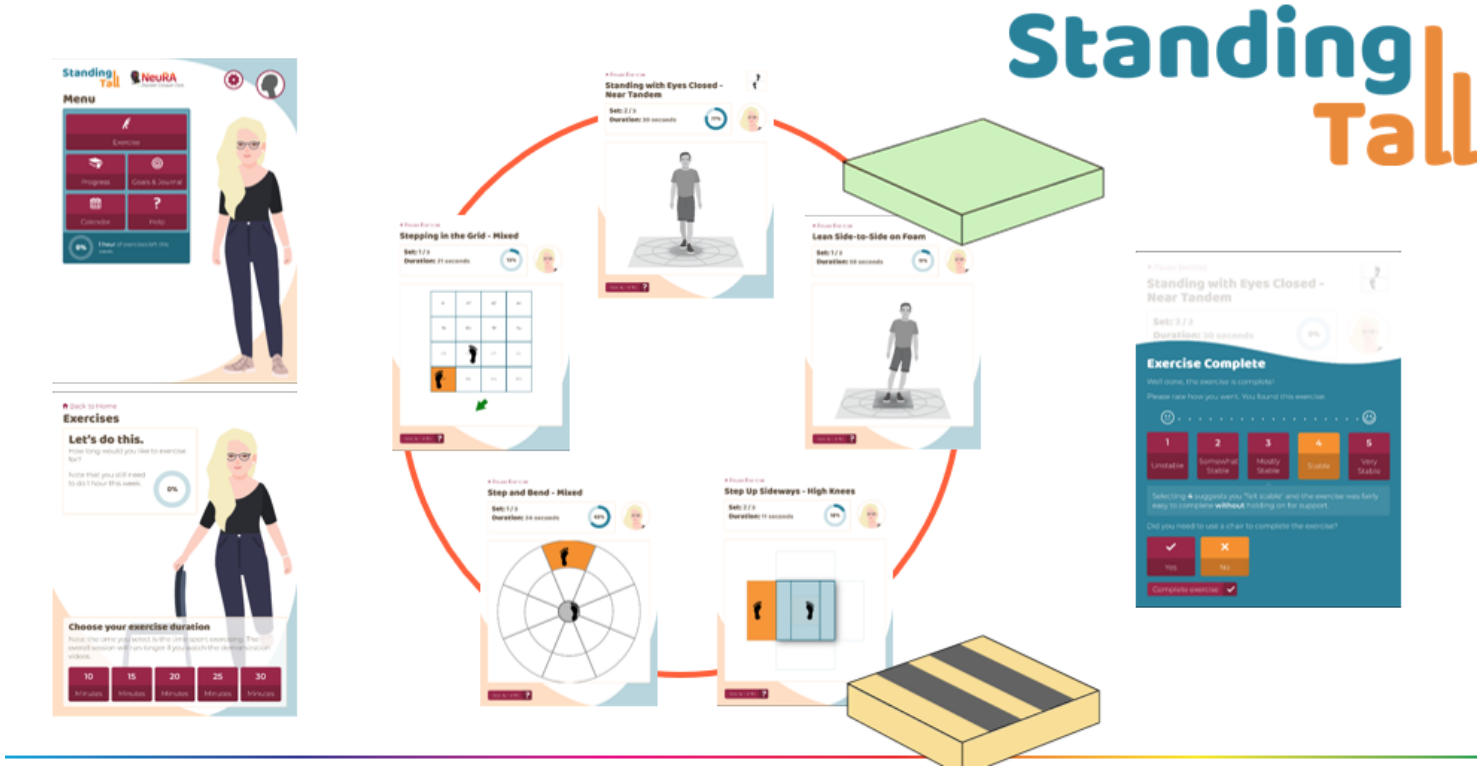




Balance intensity + dose effects



Phase 5: 2015 – Implementation Research



Kim Delbaere and colleagues. Engaging and supporting older people in fall prevention in the community: International implementation study. NHMRC Partnership Project Grant

Australian fall prevention guidelines

Australia & New Zealand Falls Prevention Society

Fall Prevention Guidelines

The Australian Commission on Safety and Quality in Health Care assists health services to reduce the number of falls, and the resulting patient harm, through a number of national initiatives. This site includes Australia's National Guidelines: *Preventing Falls and Harm From Falls in Older People: Best Practice Guidelines for Australian Hospitals, Residential Aged Care Facilities and Community Care 2009*. The guidelines provide a consistent national basis for falls prevention.

Hospitals

START HERE

- Action on Falls Prevention
- Disclaimer
- Home
- Info about falls
- Membership
- Education
- Research
- Resources
  - Fall Prevention Guidelines
  - Key Research Publications
  - Resources for Health Professionals
  - Resources for Older People and their Families

New Guidelines to be launched November, 2023!

Summary: compiling the evidence

- Delineating the problem
- Identifying the risk factors
- Conducting gold standard interventions
- Synthesising the findings
- Implementing the findings

Thank You


Australia and New Zealand
Falls Prevention Society
& World Falls Congress
2023 JOINT CONFERENCE
26 - 28 November, Perth, Western Australia
www.anzfpconference.com