An RCT of cognitive-only and cognitive-motor training to prevent falls in older people: physical, neuropsychological and neural mechanisms

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Introduction

- Both physical and cognitive functions are independent risk factors for falls.

- Physical training has been the primary focus of intervention trials to reduce falls with proven success for balance training in particular.

- The rate of falls in older people remains elevated, warranting the investigation of interventions targeting other major fall risk factors.

- No studies have examined the potential for cognitive or cognitive+motor training to prevent falls in older people, despite good evidence of fall-related cognitive and physical improvements following both intervention types.
Aim

Home-based computerised training, delivered identically, either:

- seated (cognitive)
- or standing and undertaking balance exercises (cognitive+motor)

1° - To test the effects of cognitive and cognitive+motor training, compared with a no-intervention control group, in preventing falls in older people.

2° – examine the effects of cognitive+motor and cognitive training on:
   a) physical function (i.e. balance, gait, mobility)
   b) neuropsychological function (i.e. cognitive performance)
   c) neural plasticity (i.e. changes in brain structure and function)

and calculate the cost effectiveness of delivering the interventions
Team

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$1.5million from NHMRC for 5 years (2015-2019)
Protocol

Recruitment (n=750) → Baseline Assessment → Randomisation

Time 0
- Motor-cognitive (n=250): System installation & training
- Cognitive-only (n=250): System installation & training
- Control (n=250): Falls information

4 weeks
- Home visit
- Home visit

6 months
- Blinded re-assessment

12 months
- Falls follow-up completed

Assessment feedback and referral as necessary
Interventions

Cognitive+motor:

step training system (mat and computer) interfaced with TV to play games while standing and stepping.
Outcome measures

Primary

• Prospective fall events over 12 months

Secondary

• Quality of life:
  • EuroQol EQ-5D
  • AQOL-6D
  → to estimate quality adjusted life years for the economic evaluation
• Falls efficacy (icon-FES)
2° Outcome Measures

Physical

• Balance
  • Sway
  • Coordinated stability
• Stepping performance and speed
  • Choice stepping reaction time
  • Hand reaction time
• Gait and mobility
  • GAITRite mat for spatiotemporal parameters
  • Timed Up & Go Test - with and without a verbal fluency cognitive task
2° Outcome Measures

Neuropsychological (cognitive)

- Trail Making Tests A and B - selective attention and processing speed
- Stroop test - attention and response inhibition
- Controlled Oral Word Association Test - semantic/verbal fluency
- Digit Span Test - working memory
- Wisconsin Card Sorting Test - problem solving and set-shifting
- ACER - global cognition
2° Outcome Measures

Neuroplasticity (in 105 participants)

- Brain structural plasticity - structural MRI
- White matter plasticity will be determined with Diffusion Tractography Imaging
- Functional network plasticity - resting state fMRI
- Neurometabolic plasticity - 1H-Magnetic Resonance Spectroscopy
Innovation, outcomes, significance

- potential to significantly reduce fall-related injury and enhance cognition, physical functioning and quality of life in older people
- novel intervention to examine cognitive and cognitive+motor training to prevent falls
- differential effects of the interventions will provide valuable insights into the intervention components required for efficacious fall prevention, and those required for neural, neuropsychological and physical benefits
- great potential as a wide-reaching and cost-effective fall prevention strategy
  - minimal need for therapist/trainer involvement, particular benefit to older people in rural and remote areas of Australia