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Rapid systematic review of systematic reviews: digital technologies to prevent falls in people living with dementia

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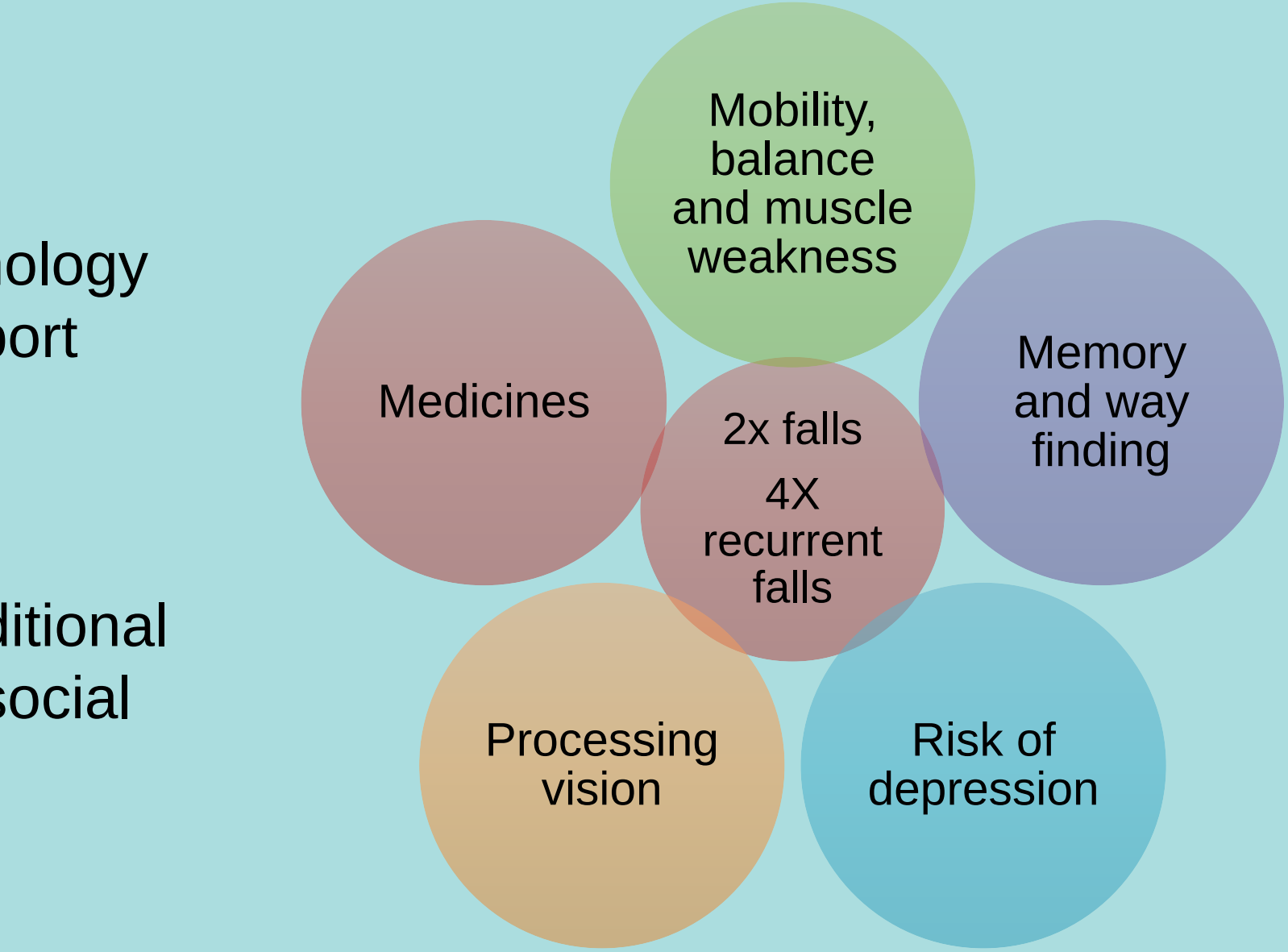
Background:

Focus on how technology can be used to support people living with dementia

Falls £4.4bn / yr additional cost for health and social care services



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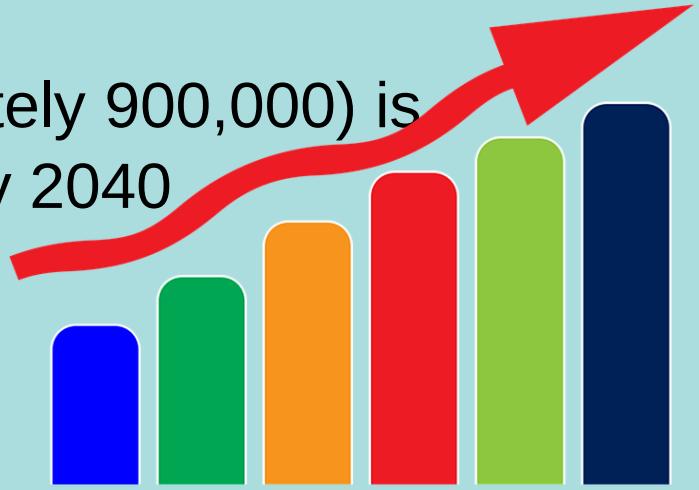
Review question:

- *"What is the evidence that digital technologies can reduce falls and fall risk for people living with dementia?"*

- People currently living with dementia in the UK (approximately 900,000) is predicted to rise to over 1 million by 2025 and 1.6 million by 2040



- Technology is rapidly evolving but little is known about which technologies are most effective or cost-effective

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Previous work

This review builds on previous relevant work:

- Stanmore, E. K., Mavroeidi, A., De Jong, L. D., Skelton, D. A., Sutton, C. J., Benedetto, V., Munford, L. A., Meekes, W., Bell, V. & Todd, C. 2019. **The effectiveness and cost-effectiveness of strength and balance Exergames to reduce falls risk for people aged 55 years and older in UK assisted living facilities: a multi-centre, cluster randomised controlled trial**. *BMC Medicine,* 17**,** 49.
- Mcgarrigle, L., Boulton, E. & Todd, C. 2020**. Map the apps: a rapid review of digital approaches to support the engagement of older adults in strength and balance exercises.** *BMC Geriatrics,* 20**,** 483.
- Mcgarrigle, L. & Todd, C. 2020. **Promotion of Physical Activity in Older People Using mHealth and eHealth Technologies: Rapid Review of Reviews**. *J Med Internet Res,* 22**,** e22201.
- NICE 2018**. Dementia: assessment, management and support for people living with dementia and their carers**. Technical Report Appendix D: Review search strategies. London.

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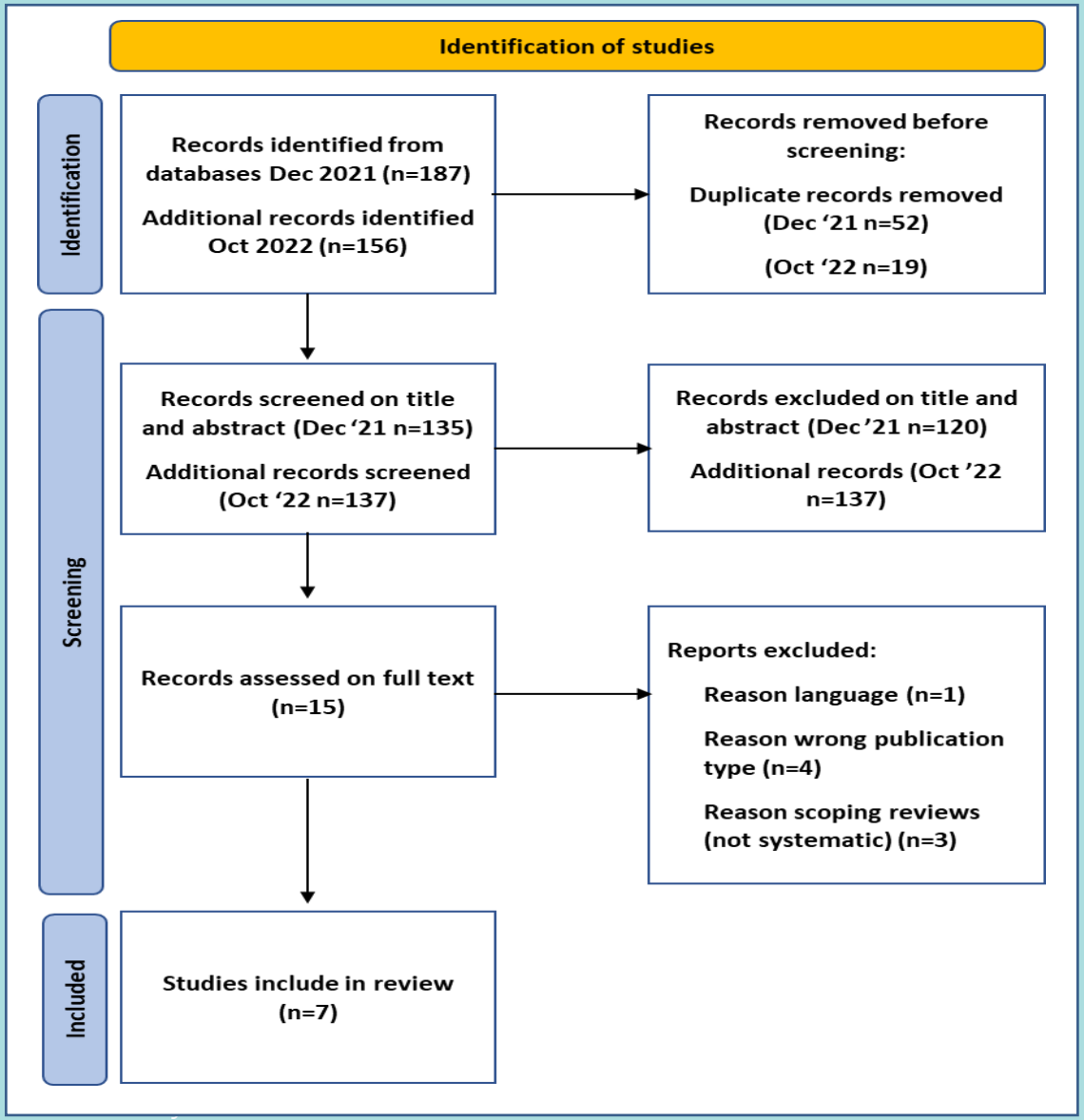
Methodology

Followed a systematic review of reviews approach

Searched following databases

- EMBASE (Ovid)
- MEDLINE (Ovid)
- CINAHL (EBSCO)
- PsychINFO (Ovid)
- Cochrane Database of Systematic Reviews (CDSR) (OVID).
- Scopus

Identified 7 systematic reviews which met our inclusion criteria



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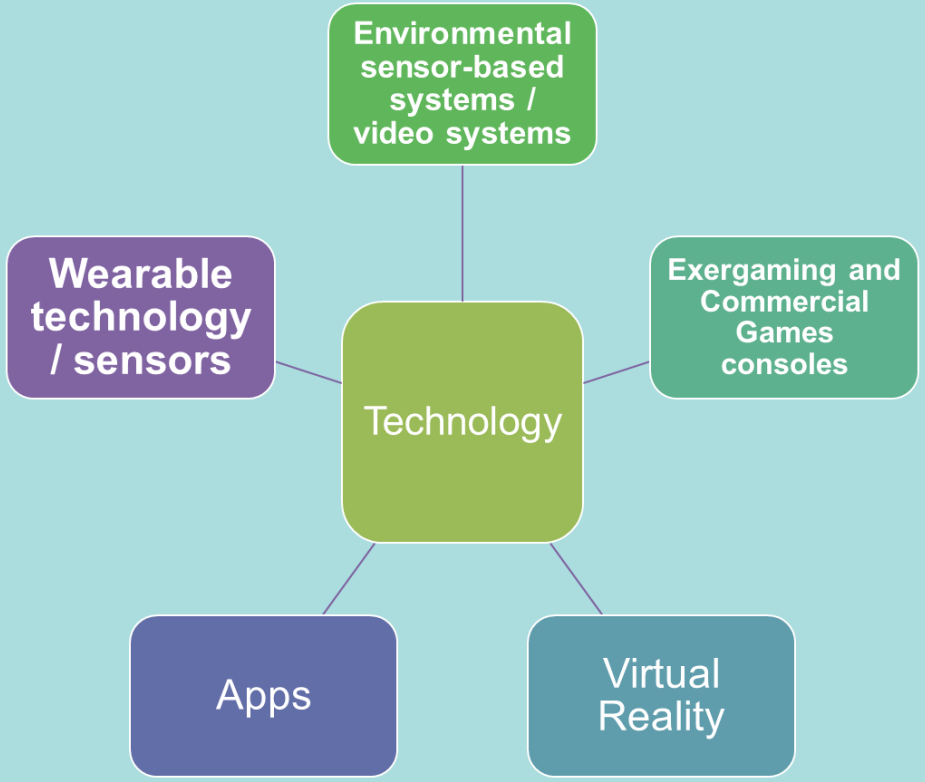
Types of technology:

Technologies were classified using the FARSEEING taxonomy: classifies and describes technology use in falls prevention studies.

- All studies included in this review were classified as Systems but differed in terms of locations.

We also found digital technologies across a range of uses

- Prediction, e.g. falls risk assessment
- Detection, e,g. alarm systems
- Monitoring, e.g. fall event recording research tools
- Prevention, e.g. detectors to identify if a person is out of bed and alerts the carer



BOULTON E, HAWLEY-HAGUE H, VEREIJKEN B, CLIFFORD A, GULDEMOND N, PFEIFFER K, HALL A, CHESANI F, MELLONE S, BOURKE A, TODD C for the FARSEEING Consortium Developing the FARSEEING taxonomy of technologies: classification and description of technology use (including ICT) in falls prevention studies. *Journal of Biomedical Informatics*, 2016 doi: 10.1016/j.jbi.2016.03.017

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Environmental sensor-based systems / video systems:

Two systematic reviews

- Brims & Oliver (2019) sensor-based interventions
  - Community dwelling
  - Included 2 RCTs reporting falls
    - Combined significantly lower risk of fall occurring
    - No significant difference in number of falls
    - Differences in technologies assessed – sensor lights only vs more comprehensive (HBTec-TS)
- Chan et al (2021) bed-exit alarms
  - Long term care setting
  - 3 studies reported falls
    - 2 (1 RCT + 1 quasi experimental) showed no difference in falls prevention
    - 1 (pre-post) sig improvement after alarms removed

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Exergaming and Commercial Games consoles:

Two systematic reviews:

- van Santen et al (2018) 3 studies using ‘FitForAll’ or ‘Wii-Fit’
  - Community and assisted living facilities
  - One pre-post test reported significant improvements on surrogate falls outcomes
  - 2 pilot RCTs – one found no significant diffs, other found a significant improvement on Berg balance scale
- Prosperini et al (2020) 3 studies with Alzheimer’s / MCI
  - Moderate overall effect of exergames on balance
  - But small number of dementia studies/ participants – unable to draw robust conclusions

Virtual reality:

www.freepik.com

One systematic review on the use of Virtual Reality in improving health outcomes for older adults (Dermody et al 2020)

- Community dwelling
- Included 1 quasi-experimental study comparing people living with and without dementia
  - Measured posture and falls
  - Those living with dementia had significantly worse
    - Postural stability
    - Longer lag in cognitive strategies for postural correction
    - Delayed reactions to falling

Apps:

Didn't find any systematic reviews looking at app-based interventions, dementia and falls

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Wearable technology / sensors:

Two systematic reviews

- Bezold et al (2021)
  - Nursing homes/hospital setting
  - 9 studies (6 prospective, 3 cross-sectional)
  - Concluded
    - Wearable sensors are an acceptable tool to distinguish between fallers / non-fallers
    - Sensor data from real life better at predicting falls
    - Accuracy – sensor location, sensor attachment, assessment method
- Weizman et al (2021) 3 observational studies focusing on predicting falls
  - 2 found sensor data useful to classify gait of fallers
  - 1 relationship between fall risk factors and sensor data

Conclusions:

- Digital technologies have potential to reduce risk falls for older people living with dementia and help them live in their own homes longer
- Some evidence from seven reviews that technologies can reduce falls and falls risk
- Not enough good quality evidence to recommend which technology is best
- People with dementia have higher falls risk, but often excluded from such studies
  - Evidence people with dementia can find the use of technology systems upsetting, and may become distressed
  - Need to include people with dementia and other cognitive impairments in design and testing of technology to ensure it meets their needs and has high usability / acceptability.
- Both effectiveness and cost-effectiveness of technology for falls prevention for people living with dementia yet to be established.

More information and full report available at:
https://www.opfpru.nihr.ac.uk/our-research/rapid-responses/

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- Bezold, J., et al. (2021). 'Sensor-based fall risk assessment in older adults with or without cognitive impairment: A systematic review' *European review of aging and physical activity*, 18 (1), pp. 1-14.
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