1    # Agile ageing – a modifiable vital sign to mitigate the risk of falls in

2    # older adults?

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12    **Abstract**

13    Falls prevention in older adults is a targeted priority because a fall can lead to
14    disability, institutionalisation and presents a signficant financial burden. Falls are
15    multifactoral in nature however, imparements in both physical and cognitive functioning
16    have been linked to their occurance. Currently, testing and exercise training for falls
17    prevention focuses on physical qualities such as balance and strength. Agility is a unique
18    physical quality that couples an individuals perceptual cognitive ability with the ability to
19    produce a quick and accurate movement. Agility is relatively well understood in a sporting
20    context however, its application to falls prevention has been minimal. Because a fall may
21    occur while an individual is percieving information from the dynamic environment around
22    them while attempting to execute a rapid and accurate movement it is hypothosised that
23    concepts and methods used to assess and train agility in athlete populations can be  use to
24    improve practices related to the screening and training to mitigate the risk of a fall in an older
25    adult.

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1 **Background**

2      Falls negatively impact the health of older adults and place significant financial strain

3 on healthcare systems. Approximately 125,000 adults aged 65 and over experienced a fall-

4 related hospitalisation in 2016-17, which has increased over the last 10 years [1]. Furthermore,

5 in 2015-16, health service expenditure on falls was estimated to be $3.8 billion in Australia [3].

6 Falls can also predispose an individual to encounter additional health-related complications,

7 most commonly fractures and soft tissue injuries [4]. As such, there is a clear need to refine

8 screening methods to identify individuals at risk of falls, and modify interventions to prevent

9 future fall-related events.

10      Deficits in cognitive and physical functioning can be major predictors of an older adult's

11 risk of future falls [5]. Improvements in physical qualities such as balance, gait and strength

12 have been associated with a reduction in falls risk [6]. Additionally, even slight deficits in

13 cognitive functioning have shown to significantly influence an older adult's risk of future

14 falls, particularly impairments in executive function and dual-task performance [7]. Therefore,

15 it is proposed that any tool designed to assess falls risk should simultaneously assess both

16 physical and cognitive function. This multifactorial approach to testing could offer greater

17 prognostic utility in the screening of falls risk than assessments used in current practice.

18      Although falls risk screening tools are widely used, evidence demonstrating their utility to

19 distinguish individuals at risk of falls is questionable. Questionnaires are commonly used,

20 such as the St. Thomas Risk Assessment Tool in Falling elderly inpatients (STRATIFY), as

21 well as physical tests such as the Timed Up-and-Go (TUG) and the Berg Balance Scale

22 (BBS) [8]. Despite their popularity, both the TUG and BBS have limited predictive value in

23 identifying individuals at risk of falls [9, 10]. Research suggests that neither of these tests be

24 used in isolation, as they are limited in their capacity to assess multiple factors of falls risk [9,

25 10]. These tests solely focus upon physical factors, such as strength, gait and balance, whilst

26 cognitive domains, such as reaction time, executive function and visual scanning, are

27 typically overlooked during an assessment of falls risk [11]. Herein, it is proposed that a test of

28 agility in this population may appropriately fulfil this role as a tool to identify individuals at

29 risk of falls, as it allows both physical and cognitive ability to be assessed.

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1    **Hypothesis**

2    In view of the relationship between an individuals physical and congnitive abilities

3    and falls it is hypothosised that agility is a key physical quality that should be assessed and

4    developed properly when identifying and mitigating falls risk. Drawing from research in the

5    area of sport, agility is defined as 'a rapid whole-body movement with change of velocity or

6    direction in response to a stimulus' [12]. This definition harmonises the interplay between

7    cognitive abilities and physical qualities, and could offer a multifactorial approach in the

8    assessment and management of falls risk in older adults. Research derived from athletic

9    populations has suggested that agility involves not only a physical change-of-direction, but

10    also perceptual-cognitive factors, such as visual scanning, knowledge of situations, pattern

11    recognition and anticipation [13]. Agility is a vital skill to possess in competitive sport, and it is

12    proposed that it may also be of considerable relevance in the older adult population.

13    Individuals often encounter situations in everyday tasks that require negotiation of either pre-

14    determined or incidental obstacles (e.g. tripping hazards such as rugs, furniture, pets and

15    surfaces with little friction), thus requiring a degree of agility to react and change direction in

16    order to prevent a fall. Furthermore, both the perceptual-cognitive and physical aspects of

17    agility have been found to be modifiable in sporting populations [14]. It is reasonable to

18    postulate that, with the use of specific training interventions, meaningful improvements are

19    also achievable within the older adult population.

20    **Evaluation of the hypothesis**

21    Agility-based tests may be a useful tool to screen for an older adult's risk of future

22    fall-related events, offering greater utility than current tests evaluating the performance of

23    pre-determined tasks. Research has previously proposed a novel test of agility [15], however the

24    test involved changes of direction that occurred in a pre-determined manner without the need

25    to react to unpredictable stimuli, such as cutting maneouvres around stationary objects.

26    Therefore, this test could be considered an assessment of change-of-direction speed, as

27    opposed to agility [16]. Whilst easy to implement and quantify, the use of time-based

28    measurements around a pre-determined course may also lack face validity, and not reflect the

29    demands of activities that contribute to a fall. More specifically, these assessments do not

30    represent everyday situations in which dynamic negotiation of obstacles is required.

31    Therefore, practitioners and researchers aiming to develop an agility-based screening test for

falls risk should consider the use of task-specific, observational assessments in an open environment that requires decision-making.

**Conclusion**

Falls remain a significant health and economic concern for older adults, and current falls risk screening tools do not comprehensively capture the multifactorial nature of falls. Extending beyond its intended purpose in athletic populations, agility has the potential to be the 'missing link' in falls risk identification and management. Due to its physical and cognitive requirements, a suitable test of agility could offer greater prognostic utility to screen for falls risk in older adults.

**Authors' contributions**

All authors contributed equally to the development of this manuscript; MO, MW and ST conceptualised the topic of the opinion piece. MO, MW and ST contributed to the writing and editing of the manuscript. All authors have read and approved the final version of the manuscript.

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