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Opinion Article

Proposals for continued research to determine older adults' falls risk

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Abstract

Early detection of older adults with an increased risk of falling could enable early onset of preventative measures. Currently used fall risk assessment tools have not proven sufficiently effective in differentiating between high and low fall risk in community-living older adults. There are a number of tests and measures available, but many timed and observation-based tools are performed on a flat floor without interaction with the surrounding. To improve falls prediction, measurements in other areas that challenge mobility in dynamic conditions and that take a persons' own perception of steadiness into account should be further developed and evaluated as single or combined measures. The tools should be easy to apply in clinical practice or used as a self-assessment by the older adults themselves.

Keywords: Accidental falls, Aged, Functional ability, Geriatric assessment/methods, Postural balance

Determining risk of falling is a complex matter that involves multiple predisposing and precipitating factors[1]. More research is needed to develop clinical measures that reflect the multifactorial nature of falls, the heterogeneity of older adults, and location of the fall. This includes tools that can determine risk of falling in independent well-functioning older adults, who are also prone to falls[2,3], so that onset of interventions at an early stage is enabled and, thus, physical and psychological distress caused by falls is prevented.

The results of our recently published study[4] did not support a recommendation to use Timed Up and Go Test or Short Physical Performance Battery for predicting falls among well-functioning older adults. Although problems with gait and balance are frequently found to be risk factors for falls[5], a systematic review and meta-analysis found that fall risk assessment tools currently used in community-dwelling older adults did not show sufficiently high predictive validity for differentiating high and low fall risks when used as single measurements[6].

Maybe other aspects of gait and balance would be preferable than an indoor performance of timed or observed activities? Gait adaptability could be a key variable to assess risk of falling. Based on visual input, proactive gait adaptability refers to the ability to quickly adjust our walking patterns to our surroundings. These changes put demands on step precision and avoidance of obstacles[7]. In everyday life, gait adaptations need to be made when walking on different terrains, turning, or walking in a crowd. In comparison with younger adults, older adults have been found to have altered gait strategies when approaching an obstacle, which become more pronounced when there is limited time to avoid the obstacle or in dual-task conditions[8]. The strategies include lowered walking-speed when approaching an obstacle[9], more often employing a short-step strategy, slower reaction times, less toe and heel distance to the obstacle, and larger foot clearances, resulting in a lower success rates in obstacle avoidance tests than younger adults[10]. Altered kinematic patterns in older adults compared to younger people have been well documented concerning gait adaptability[7], with decreased lower limb muscle strength as one probable cause[11]. The ability to react to unexpected loss of balance

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has the potential to also contribute to the predictive ability of falls. However, knowledge of the type of measurement that is best suited to identify poor gait stability and the ability to regain balance is lacking. Promisingly, a systematic review with meta-analysis has presented some findings that indicate that older adults' falls are reduced by almost 50% by training of reactive and volitional step training[12]. Nevertheless, there is a lack of large studies focusing on predictive measurements with a prospective follow-up of falls both regarding the ability to negotiate obstacles and the ability to regain balance and, thus, the predictive value is unknown.

Another area of research to be further developed is older adults' own experiences of their steadiness or balance. Some previous studies indicate that the self-perception of steadiness could be a successful way forward to predict falls in well-functioning older adults. In a recent 2-year prospective study self-reported unsteadiness during walking was associated with an increased risk of recurrent falls[13] and in a previous longitudinal study perceived balance problems predicted injurious falls[14]. A scale of steadiness has been developed[15] but there is still a lack of knowledge how to best formulate the question or how to construct a scale. Yet another area that warrants further research is disparities between perceived balance and performed activities[16-18]. If an older adult perceives their balance as good but their performance is poor, he or she may have an increased risk of falling.

The time has come to develop fall-predictive assessments facilitated by digital technology that involve interactions with the surrounding, are evaluated for measurement properties and easy to use in clinical practice, or by the older adults themselves in their own homes. One option could be to further develop registration of walking patterns relative to the surrounding by sensors within soles in shoes and smartphones[19]. Other tools which also could be provided for self-management of fall-predictive assessments are interactive videogames or virtual reality technology. These technologies may comprise tools that can be used to offer different scenarios, register the difficulty level of the selected activity, measure the performance in a reproducible way and present real-time data. In addition, wearable sensors have been proposed to be a promising tool for monitoring older adults' activity in their own home and provide health-care professionals with data to give personal advice for fall-prevention exercise[20]. The above-mentioned suggestions call for collaboration between different disciplines for development of the measurements.

In summary, commonly used tools are insufficient in predicting older community-living adult's fall risk. It is now time to "reshape" the toolbox, as well as give older adults' own perception of their fall risk a more central role in the assessment. The development and prospective evaluation of measurements in the above presented areas might increase the predictive ability of falls in particular for well-functioning older adults and, in addition, be helpful in tailoring interventions for preventing falls. It is of major importance that these tools present real time data and are easy to use in clinical practice as well as by older adults themselves. Self-assessments can enable more rapid and frequent assessments followed by preventive measures.

References

1. Deandrea S, Lucenteforte E, Bravi F, Foschi R, La Vecchia C, Negri E. Risk factors for falls in community-dwelling older people: a systematic review and meta-analysis. Epidemiology 2010;21(5):658-68.
2. Nordin E, Moe-Nilssen R, Ramnemark A, Lundin-Olsson L. Changes in step-width during dual-task walking predicts falls. Gait Posture 2010;32(1):92-7.
3. Moreira MN, Bilton TL, Dias RC, Ferriolli E, Perracini MR. What are the Main Physical Functioning Factors Associated With Falls Among Older People With Different Perceived Fall Risk? Physiother Res Int 2017;22(3).
4. Pettersson B, Nordin E, Ramnemark A, Lundin-Olsson L. Neither Timed Up and Go Test nor Short Physical Performance Battery predict future falls among independent adults aged ≥75 years living in the community. J Frailty Sarcopenia Falls 2020;5(2):24-30.
5. Ambrose AF, Paul G, Hausdorff JM. Risk factors for falls among older adults: a review of the literature. Maturitas 2013;75(1):51-61.
6. Lusardi MM, Fritz S, Middleton A, Allison L, Wingood M, Phillips E, et al. Determining Risk of Falls in Community Dwelling Older Adults: A Systematic Review and Meta-analysis Using Posttest Probability. J Geriatr Phys Ther 2017;40(1):1-36.
7. Weerdesteyn V, Hollands KL, Hollands MA. Gait adaptability. Handb Clin Neurol 2018;159:135-46.
8. Galna B, Peters A, Murphy AT, Morris ME. Obstacle crossing deficits in older adults: a systematic review. Gait Posture 2009;30(3):270-5.
9. Caetano MJ, Lord SR, Schoene D, Pelicioni PH, Sturnieks DL, Menant JC. Age-related changes in gait adaptability in response to unpredictable obstacles and stepping targets. Gait Posture 2016;46:35-41.
10. Weerdesteyn V, Nienhuis B, Duysens J. Advancing age progressively affects obstacle avoidance skills in the elderly. Hum Mov Sci 2005;24(5-6):865-80.
11. Shin S, Demura S, Watanabe T, Yabumoto T, Shi B, Sakakibara N, et al. Age-related and obstacle height-related differences in movements while stepping over obstacles. J Physiol Anthropol 2015;34:15.
12. Okubo Y, Schoene D, Lord SR. Step training improves reaction time, gait and balance and reduces falls in older people: a systematic review and meta-analysis. Br J Sports Med 2017;51(7):586-93.
13. Donoghue OA, Setti A, O'Leary N, Kenny RA. Self-Reported Unsteadiness Predicts Fear of Falling, Activity Restriction, Falls, and Disability. J Am Med Dir Assoc 2017;18(7):597-602.
14. Muir SW, Berg K, Chesworth B, Klar N, Speechley M. Balance impairment as a risk factor for falls in community-dwelling older adults who are high functioning: a prospective study. Phys Ther 2010;90(3):338-47.
15. Clark DO, Callahan CM, Counsell SR. Reliability and validity of a steadiness score. J Am Geriatr Soc 2005;53(9):1582-6.
16. Delbaere K, Close JC, Brodaty H, Sachdev P, Lord SR. Determinants of disparities between perceived and physiological risk of falling among elderly people: cohort study. BMJ 2010;341:c4165.
17. Butler AA, Lord SR, Taylor JL, Fitzpatrick RC. Ability versus hazard: risk-taking and falls in older people. J Gerontol A Biol Sci Med Sci 2015;70(5):628-34.

18. Kluft N, van Dieen JH, Pijnappels M. The degree of misjudgment between perceived and actual gait ability in older adults. Gait & Posture 2017;51:275-80.
19. Yang ZL, Song C, Lin F, Langan J, Xu WY. A Smart Environment-Adapting Timed-Up-and-Go System Powered by Sensor-Embedded Insoles. Ieee Internet Things 2019;6(2):1298-305.
20. Lord SR, Close JCT. New horizons in falls prevention. Age Ageing 2018;47(4):492-8.