Medical Xpress

Virtual reality and treadmill training could help prevent falls in older adults

August 12 2016

Combining virtual reality and treadmill training helps prevent falls in older adults better than treadmill training alone, according to a new randomised controlled trial published in *The Lancet*. The authors say that the intervention, which combines the physical and cognitive aspects of walking, could potentially be used in gyms, rehabilitation centres or nursing homes to improve safe walking and prevent falls in older adults or people with disorders which affect movement such as Parkinson's disease.

Falls in adults aged 65 and over account for 1-2% of all healthcare expenditure in high-income countries. 30% of older adults living in the community, and as many as 60-80% of older adults with mild cognitive impairment, dementia or Parkinson's disease, fall at least once a year. Falls can cause injuries, loss of independence, disability, institutionalisation, and death. Even without injuries, falls often lead to fear of falling, avoiding leaving the house and depression, which in turn often leads to inactivity, muscle weakness, impaired balance and gait, more falls and more social isolation.

In this trial, researchers analysed data from 282 participants from five clinical sites in Belgium, Israel, Italy, the Netherlands, and the UK between 2013 and 2015. All participants were aged 60-90, were able to walk at least 5 minutes unassisted, on stable medication, and had reported at least 2 falls in the 6 months before the start of the study. Nearly half of all participants (130) had Parkinson's disease, and some (43) had mild cognitive impairment.

Participants were assigned to treadmill training with virtual reality (146), or treadmill training alone (136). The virtual reality component consisted of a camera that captured the movement of participants' feet and projected it onto a screen in front of the treadmill, so that participants could 'see' their feet walking on the screen in real time. The game-like simulation was designed to reduce the risk of falls in older adults by including real life challenges such as avoiding and stepping over obstacles like puddles or hurdles, and navigating pathways (see figure 1 & link to images/videos provided below).

On average, participants in each group took part in 16 training sessions over six weeks, with each session lasting about 45 minutes. Fall rates were recorded in the six months following the end of training. Prior to training, participants in the treadmill only group had an average of 10.7 falls per six months, and participants in the treadmill plus virtual reality group averaged 11.9 falls per six months.

During the six months after training, the incidence rate of falls decreased in both groups, but the decrease was only statistically significant (i.e. better than chance) in the treadmill plus virtual reality group (11.9 to 6.0 falls in the virtual reality group - a 42% reduction; compared to a decrease from 10.7 to 8.3 in the treadmill only group) (table 2 and figure 3).

"Falls in older people often occur because of tripping and poor obstacle negotiation while walking. Falls often start a vicious cycle, which has many important negative health consequences. Older people's ability to negotiate obstacles can be impaired because of age-related decline in cognitive abilities like motor planning, divided attention, executive control, and judgement, yet current interventions for falls in older adults typically focus on improving muscle strength, balance, and gait," explains study author Dr Anat Mirelman, Center for the study of Movement, Cognition and Mobility (CMCM), Neurology Institute, Tel

Aviv Sourasky Medical Center, and Sackler School of Medicine, Tel Aviv University, Tel Aviv, Israel.

She adds: "Our approach combines treadmill exercise and virtual reality to help improve both physical mobility and cognitive aspects that are important for safe walking. We found that virtual reality plus treadmill training helped to reduce fall frequency and fall risk for at least six months after training."

The biggest improvement was seen in participants with Parkinson's disease, and the authors suggest that this could be due to a number of factors, including that they had higher rates of falls at the start of the study, or that virtual reality was able to help improve cognitive and motor skills which are affected in Parkinson's disease. However, although these are interesting findings, the authors warn that the study was not powered to measure differences in between sub-groups, so further research is needed to verify these explanations.

The authors also caution that the follow-up period for participants in this trial was only six months per patient, so further research will be needed to see if there is a long term effect and whether maintaining the training period could help to extend the benefits of training. Although this is the largest study of its kind so far, the number of participants involved was small, and included older people who had a history of multiple falls.

Dr Mirelman says: "Treadmills are widely available, and the additional cost of treadmill training plus virtual reality is about 4000 euros for the set-up. Our study used personalised supervision, but this might not be necessary in everyday practice where group training might be more suitable. Further studies will need to examine whether treadmill training plus virtual reality could be used as part of a prevention package to treat fall risk before falls become common and before injuries occur."

Writing in a linked Comment, Professor Stephen R. Lord, University of New South Wales, Randwick, New South Wales, Australia, says: "The finding of a 42% reduction in falls is in line with the most effective fall preventions that have assessed more traditional group-based and homed-based exercise interventions in older people and well above the average reduction of 17% for exercise interventions reported in systematic reviews. It is also notable that the reduction in falls reported in the current trial is made in comparison to a treadmill walking intervention of similar intensity, as opposed to no intervention or usual care... Mirelman and colleagues' findings have important implications for clinical practice. No serious adverse events occurred and adherence was good. A health economic analysis was not presented, and although it is the case that VR training is not substantially more resource-intensive than treadmill training, one-on-one supervision was used in this study. It is conceivable, however, that treadmill training with a VR component could be administered in community gyms and rehabilitation clinics, and since the intervention is relatively short term in nature, throughput of many people would be possible."

Provided by Lancet

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