Plenary 5 Session Theme: Looking to the future

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David M. Buchner, M.D., M.P.H. is a professor in the Department of Kinesiology and Community Health at the University of Illinois at Urbana-Champaign. He has published extensively in the area of physical activity and public health, with an emphasis on promotion of physical activity and prevention of fall injuries in older adults. He was the principal investigator for the Seattle FICSIT trial. Dr Buchner joined the University of Washington faculty in 1982, and rose to the rank of Professor of Health Services in the School of Public Health and Community Medicine. In 1999, Dr Buchner joined CDC as Chief of the Physical Activity and Health Branch. In this role, he was chairman of the writing group for the *2008 Physical Activity Guidelines for Americans* and he participated in numerous national initiatives involving physical activity and public health. In 2008 Dr Buchner was appointed to an endowed chair as Shahid and Ann Carlson Khan Professor in Applied Health Sciences at UIUC.

Dr Stuart Smith
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Dr Stuart Smith is a Senior Research Officer at Neuroscience Research Australia in Sydney. He has both an MSc and PhD in Experimental Psychology with postdoctoral work at the NASA Ames Research Centre in California followed by academic posts at Trinity College Dublin and University College Dublin. His research interests involve the development and evaluation of telehealth technologies, in particular for monitoring fall risk in older adults. Prior to returning to Australia in 2007, Dr Smith was involved in the Technology Research for Independent Living centre (http://www.trilcenter,org) in Ireland. He is Chair of a Health Informatics Society of Australia Special Interest Group on Games for Health and is coordinating activities between health researchers and the video games industry in Australia. Dr Smith's research is supported by the National Health and Medical Research Council (NHMRC) of Australia Career Development Award-Industry, NHMRC Project and NHMRC Partnership grants.

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Associate Professor Hylton Menz is a podiatrist who graduated with first class Honours and the University Medal from La Trobe University in 1993, and completed his PhD focusing on gait patterns, balance and falls at the University of NSW in 2002. He is currently an NHMRC Research Fellow and Director of the Musculoskeletal Research Centre at La Trobe University. Associate Professor Menz has published widely in podiatry, gerontology and biomechanics journals and is the Editor-in-Chief of the *Journal of Foot and Ankle Research*. In 2006, Associate Professor Menz was awarded the Young Tall Poppy Award by the Australian Institute for Policy and Science. Associate Professor Menz's current research focuses on the prevalence, impact and management of foot disorders in older people.

PHYSICAL ACTIVITY AND THE PRIMARY PREVENTION OF FALL INJURIES

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The aims of this presentation are (1) to review the historical and current recommendations for use of physical activity (e.g. exercise programs) in prevention of falls, and (2) to discuss the next steps that could lead to specific public health guidelines for primary prevention of falls.

By the mid 1990s, randomized controlled trials of fall prevention interventions demonstrated reductions in falls due to risk factor modification. In particular, randomized trails that were part of the FICSIT (Frailty and Injuries: Cooperative Studies of Intervention Techniques) studies reported falls were reduced by multiple risk factor interventions that included exercise components, and by exercise interventions alone. The focus of fall prevention interventions on balance training and strength training was novel, as historically physical activity and public health had focused on aerobic activity. The research led to clinical practice guidelines recommending exercise, and in particular balance training, in the prevention of falls in older adults. Also in the mid 1990s, public health guidelines for physical activity shifted from the historical focus on vigorous-intensity aerobic activity, to an emphasis on moderate-intensity aerobic activity like walking.

Recently, physical activity guidelines and fall prevention guidelines began to overlap. For example, the *2008 Physical Activity Guidelines for Americans* and the 2010 World Health Organization's *Global Recommendations on Physical Activity and Health* both recommend muscle-strengthening activities for all adults, and recommend activities that enhance balance for adults at increased risk of falls or with mobility limitations. The guidelines essentially address secondary prevention of falls in a subgroup of older adults at increased risk.

The next step is research to lay the basis for guidelines addressing the primary prevention of falls. Primary prevention involves exercise in adults at low risk of falls to prevent or delay developing fall risk factors such as poor balance. A key aspect of this research will be studies of balance-training only interventions (e.g. that provide information on dose-response), and observational research on how measures of balance predict risk of health outcomes in large populations (after adjustment for aerobic fitness and muscle strength). An emerging area of research is prevention of fall injuries in young and middle-aged adults. For example, when playing recreational sports, are physically fit middle-aged adults less likely to sustain a fall-related injury? There is growing evidence that less sitting time (and therefore more light-intensity activity) has health benefits independent of the amount of moderate-to-vigorous physical activity. Research on how fall prevention exercise programs affect sitting time would be useful. It is possible that further research on stretching might show stretching is important for injury prevention including fall injuries. Currently, public health guidelines do not state that people at increased fall risk should delay aerobic activity (e.g. walking programs) until after risk factors like balance and muscle weakness are addressed. Research could address if such a guideline is warranted, and if so, address how to modify aerobic activity.

SHOULD WE WII? AN OVERVIEW OF THE EXERGAME APPROACH TO FALL RISK REDUCTION

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In the both the popular media and scientific literature, the playing of video games has often been associated with negative health outcomes such as increased aggression and violence, problems with addiction to gameplay, social withdrawal, increased sedentary behaviour, increased risk of cardiovascular problems, and even increased risk of epileptic seizures.

Despite the gloom surrounding the negative health consequences of engaging in video gameplay, there is an increasing interest in the potential health-related benefits of "serious" games. Serious gaming refers to the use of video game technology for other than purely entertainment purposes. Video games have been used to train surgeons in laparoscopic surgery, teach children about a range of health and dietary issues, educating medical students about fall risk in older people through to improving cancer-related knowledge in adolescents with cancer.

Many commercially available interactive gaming systems ("exergames") have also had significant impact on the problem of obesity and diabetes in children, adolescent and adults. Video games are being used to promote healthy diets in young adults, increase energy expenditure in young children, promote physical

activity and decrease sedentary time as well as promote weight loss among overweight children and adolescents and increase overall fitness.

However video games aren't just for the young, a recent survey of video game use in Australian households suggests that 52% of people aged 51 and older report that they play video games.[1] Retirement villages, aged care facilities and independently living older adults worldwide are exploring the use of exergame systems like the Nintendo Wii for fun, recreation and exercise. In a health context however, there is also the possibility that playing Wii tennis may do more than increase activity levels in older adults. Recent research indicates that playing exergames had a significant impact on reducing depressive symptoms and improving mental health-related quality of life measures in a group of community-dwelling older adults aged 65 and over.[2]

The aim of this presentation will be to review the scientific literature investigating the effectiveness of exergames like the Nintendo Wii in relation to the problem of postural instability and falls in older adults. We will also discuss recent efforts by our team at Neuroscience Research Australia to develop a framework for future development of video games that could be useful for home-based exercise training for older adults to reduce the risk of falls.[3] In doing so we hope to answer, "to Wii or not to Wii - that is the question".

References

1. Brand J. Interactive Australia, 2009, The Centre for New Media Research.
2. Rosenberg D, Depp CA, Vahia IV et al. Exergames for subsyndromal depression in older adults: a pilot study of a novel intervention. Am J Geriatric Psychiatry 2010;18(3):221-6.
3. Smith ST, Sherrington C, Studenski S et al. A novel Dance Dance Revolution (DDR) system for in-home training of stepping ability: basic parameters of system use by older adults. Br J Sports Med published online first, November 2009.

DOES PODIATRY HAVE A ROLE TO PLAY IN FALLS PREVENTION?

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Background

There is a growing body of evidence that foot problems and inappropriate footwear impair balance and increase the risk of falls in older people. Given that these risk factors are potentially amenable to intervention, podiatry may have a valuable contribution to make to falls prevention programs, however this is yet to be evaluated in a clinical trial. The aim of this presentation is to provide an overview of the background to, and results of, a recently completed randomised controlled trial of a multifaceted podiatry intervention designed to improve balance and prevent falls in older people.

Methods

We randomly allocated 305 community dwelling men and women aged 65 years and over with foot pain and an increased risk of falling to a control or intervention group. The "usual care" control group received routine podiatry (i.e. nail care and callus debridement). The intervention group received usual care plus a multifaceted podiatry intervention consisting of: (i) prefabricated insoles customised to accommodate plantar lesions; (ii) footwear advice and assistance with the purchase of new footwear if current footwear was inappropriate; (iii) a home-based exercise program to strengthen foot and ankle muscles; and (iv) a falls prevention education booklet. Primary outcome measures were the number of fallers, number of multiple fallers and the falls rate, recorded by a falls diary over a 12 month period. Secondary outcome measures assessed six months after baseline included the Short Form 12 (SF-12), the Manchester Foot Pain and Disability Index (MFPDI), the Falls Efficacy Scale International, foot and ankle strength and range of motion tests, and a series of balance and functional tests. Primary outcome measures were analysed using relative risks (for comparisons of the number of fallers and multiple fallers), and negative binomial regression (for comparison of the falls rate). Secondary outcome measures were analysed using the linear regression approach to analysis of covariance.

Results

Of the total sample (n = 305), 90% (n = 276) attended the six month follow-up and 97% (n=296) completed the 12 month follow-up. At the six month follow-up, there were significant improvements in secondary outcome measures of the SF-12 physical subscale, the MFPDI function subscale, and several measures of foot and ankle strength and range of motion, balance and functional ability in the intervention group compared with the control group. After 12 months of follow-up, 264 falls were documented. There were no

significant differences between the groups in the proportion of fallers (relative risk [RR] 0.85, 95% CI 0.66 to 1.08, p = 0.19) or multiple fallers (RR 0.62, 95% CI 0.38 to 1.04, p = 0.07), however there was a significant reduction in falls rate in the intervention group compared with the control group (incidence rate ratio 0.64, 95% CI 0.45 to 0.91, p = 0.01).

Conclusions
In older people with foot pain and an elevated risk of falling, a multifaceted podiatry intervention improves several aspects of foot and ankle function, balance and functional ability, and reduces the rate of falls by 36%. These novel findings suggest that podiatry has a valuable role to play in preventing falls in older people.