

# Sensory-Motor Aging Research and Implications for Practice and Policy

CAG2018 Pre-Conference Workshop | October 18, 2018

Vancouver, British Columbia

## Agenda:

### Part 1: Current Canadian Research (1 hour 30 minutes)

1. *Hearing, vision and balance impairments: A snapshot of the Canadian population*  
Paul Mick
2. *Aging effects on the sensori-motor control of balance*  
Mark G. Carpenter, Jean-Sébastien Blouin, J. Timothy Inglis
3. *Vision loss and multi-sensory functioning: Importance and implications for healthy aging*  
Walter Wittich
4. *Auditory aging: More than just ears*  
M. Kathleen Pichora-Fuller
5. *Cognition and aging: Multi-tasking as an example of sensory-motor-cognitive interactions*  
Karen Z. H. Li, Halina\_Bruce, Louis Bherer, Louis, Jennifer L. Campos, Jean-Pierre Gagné, Sin-Tung Lau, Sin-Tung, Victoria Nieborowska, Natalie Phillips, Natalie, M. Kathleen Pichora-Fuller, & Nancy St-Onge
6. *Discussion*  
Brian Westerberg (Facilitator)

### Break with refreshments (15 minutes)

### Part 2: Implications for Practice and Policy (1 hour 15 minutes)

7. *Screening of vision and hearing of older adults with cognitive impairment by nurses in a long-term care facility*  
Katherine McGilton, Fiona Höbler, Walter Wittich, Kathleen Pichora-Fuller, Tammy Labreche, Marilyn Reed
8. *Implications for clinical practice*  
Lynn Beattie (Discussant)
9. *Implications for public health policy and practice*  
Paul Mick (Discussant)
10. *Final discussion*  
Kathleen Pichora-Fuller (Discussant)

## Presenters, Discussants and Facilitators:

### **B. Lynn Beattie, MD, FRCPC**

Professor Emerita, Division of Geriatric Medicine, Department of Medicine  
University of British Columbia



### **Paul Mick, MPH, MD**

Clinical Assistant Professor, Division of Otolaryngology,  
Department of Surgery  
University of British Columbia (Kelowna)



### **Mark Carpenter, PhD**

Professor and Associate Director Research, School of Kinesiology  
University of British Columbia



### **M Kathleen Pichora-Fuller, PhD**

Professor, Department of Psychology  
University of Toronto and  
Adjunct Professor, Department of Gerontology  
Simon Fraser University



### **Karen Z. H. Li, PhD**

Professor, Department of Psychology  
Concordia University



### **Brian Westerberg**

Clinical Professor, Department of Surgery  
University of British Columbia and  
Head, Division of Otolaryngology – Head and Neck Surgery  
Providence Health Care



### **Katherine McGilton, RN, PhD, FAAN**

Senior Scientist, Toronto Rehabilitation Institute-UHN and  
Professor, Lawrence S. Bloomberg Faculty of Nursing  
University of Toronto,



### **Walter Wittich, PhD, FAAO, CLVT**

Assistant Professor, School of Optometry  
University of Montreal



## ***Hearing, vision and balance impairments: A snapshot of the Canadian population***

Paul Mick,

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**Abstract:** Treatment of sensory impairment relies on using other senses to compensate. Multiple sensory impairments and professional silos render such strategies more challenging. The prevalence of individual and combined sensory impairments, and associations between having 1, 2 and 3 different types of sensory loss and measures of healthy aging will be described using data from the first wave of the Canadian Longitudinal Study on Aging. Hearing loss was defined as a pure tone average > 25 dBHL, vision loss as a visual acuity worse than logMAR=0.2, and balance loss as static standing balance <5 seconds. Multivariable regression was performed to determine the risk of co-occurrence of different types of sensory loss, and to determine the degree to which having 1, 2 or 3 types of sensory losses were associated with poorer health outcomes. Analyses were stratified by sex. There were 30,097 participants. The overall prevalence of having 1, 2 and 3 impairments was 32.1%, 12.7%, and 3.1%, respectively. The prevalence of having just one impairment increased with age to approximately 40% at 72 years, then started to decline. Above age 72, the proportion of those with multiple impairments surpassed the proportion with just one. Sensory impairments co-existed in individuals at rates higher than expected by chance. More impairments were associated with lower social participation, loneliness, poorer cognition, falls, slower gait and home care use. Multiple sensory losses are highly prevalent among older Canadians and are associated with poorer physical, cognitive and social health, and greater use of health care.

## ***Aging effects on the sensori-motor control of balance***

Mark G. Carpenter<sup>1</sup>, Jean-Sébastien Blouin<sup>1</sup>, J. Timothy Inglis<sup>1</sup>

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**Abstract:** Falls pose the greatest health risk to older adults, as falls are the leading cause of accidental death and the number one cause of hospitalization due to unintentional injury in older adults. As a result, fall-related injuries account for the highest proportion of total health care costs in Canada. Maintenance of balance under static (quiet standing) and dynamic (reactive) conditions relies heavily upon the integration of multiple sources of sensory information (visual, vestibular, auditory and proprioceptive), to trigger and modulate balance responses that are task and context dependent. While changes in sensori-motor integration have been considered important contributors to age-related declines in balance and falls, prior studies have rarely measured changes in sensory thresholds, sensory delays or sensori-motor coupling within balance-specific contexts. This workshop will highlight new evidence we have developed using novel techniques to measure balance-relevant changes in sensori-motor function in young and older adults, and discuss how these age-related changes in sensori-motor control may be associated with changes in static and dynamic balance performance.

## ***Vision loss and multi-sensory functioning: Importance and implications for healthy aging***

Walter Wittich,

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**Abstract:** Changes in sensory ability across the lifespan are to be expected and do not necessarily indicate the presence of a disease process. However, the number of individuals affected with combined vision and hearing impairment, specifically among older adults, has consistently been increasing over the past decades. In Canada, it has been estimated that, among persons with acquired dual sensory loss, the proportion of persons over the age of 65 has increased from 21.6% in 1998 to 45.4% in 2005, in large part due to the changing population demographics. The multiplicative nature of this unique impairment combination hinders traditional rehabilitation approaches because the compensatory abilities of one sense for the other are reduced or eliminated. The implications for successful aging are substantial and often overlooked or assigned as “normal” in the context of fragility and multi-morbidity. Service delivery planning will need to strongly consider the growing presence of older adults as the baby boomers move through retirement age. The distribution of their visual and auditory abilities indicates that the large majority of this client group has residual vision and hearing that can be maximized in the rehabilitation process in order to restore functional abilities and social participation.

## ***Auditory aging: More than just ears***

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**Abstract:** Hearing loss is one of the three most common chronic disabilities affecting older adults and it has been associated with incident dementia, falls, and other health issues. A hallmark of age-related hearing loss is reduced ability to detect high-frequency sounds as measured using audiometry. Such threshold elevations may result from damage to the outer hair cells caused by noise exposure or to changes in endocochlear potentials caused by changes in the blood supply to the inner ear. However, difficulties understanding speech in noise precede clinically significant elevations in audiometric thresholds. These difficulties result from declines in supra-threshold auditory processing involving neural changes throughout the auditory system. Importantly, communication often occurs in noise when people are multi-tasking and it underpins social interaction. Even before hearing thresholds decline to a point where older adults become candidates for hearing aids, they often begin to withdraw from social engagement because communication in challenging listening situations is too cognitively demanding. The connections between auditory, cognitive and social factors suggest that there is potential to modify hearing loss to reduce age-related cognitive and social health risks. Solutions could include new approaches to screen for age-related hearing problems earlier and to provide interventions incorporating a range of behavioural, technological and environmental strategies to optimize listening in everyday situations.

## ***Cognition and Aging: Multi-tasking as an example of sensory-motor-cognitive interactions***

Karen Z. H Li<sup>1</sup>, Halina Bruce<sup>1</sup>, Louis Bherer<sup>2</sup>, Jennifer L. Campos<sup>3,5</sup>, Jean-Pierre Gagné<sup>4</sup>, Sin-Tung Lau<sup>3</sup>, Victoria Nieborowska<sup>1</sup>, Natalie Phillips<sup>1</sup>, M. Kathleen Pichora-Fuller<sup>5</sup>, & Nancy St-Onge<sup>6</sup>

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**Abstract:** Everyday functioning commonly requires one to multi-task, often involving cognitive processes and motor processes (e.g., talking while walking, standing while listening). Age-comparative research indicates a marked decline in such multi-tasking ability, owing to the competition for cognitive resources that support both cognitive and motor functions in late life. An added consideration in multi-tasking is the normative decline of sensory processes, and findings of greater reliance on cognitive capacity with sensory impairment. Through a series of age-comparative multi-tasking experiments, we have examined the impact of hearing loss on multi-tasking ability (e.g., walking + listening; balancing + auditory memory). Moreover, we have shown that increasing cognitive capacity through six weeks of training leads to improved multi-tasking performance (listening and balancing). Together, the inter-relationships that we demonstrate among auditory, cognitive, and motor domains suggest new avenues for maintaining or improving multi-tasking ability, addressing hearing loss, and preventing falls.

## ***Screening of vision and hearing of older adults with cognitive impairment by nurses in a long-term care facility***

Katherine S. McGilton<sup>1,2</sup>, Fiona Höbler<sup>1</sup>, Walter Wittich<sup>3</sup>, M. Kathleen Pichora-Fuller<sup>4</sup>, Tammy Labreche<sup>5</sup>, & Marilyn Reed<sup>6</sup>

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**Abstract:** The goal of this study was to determine the most feasible and sensitive tests for hearing and vision screening that nurses should use in their practice. Following a staged mixed methods' design, three registered nurses and four vision and hearing specialists tested a package of sensory screening tools with 18 residents living in long-term care with cognitive impairment. Participating professionals provided feedback on the practicability, sensitivity and appropriateness of the tools. Inter-rater reliability was assessed, as two experts in vision and hearing administered the same screening test to the residents. For purposes of construct validation of the screening tools, an audiologist and optometrist also tested the residents using gold standard hearing and vision assessments. The recommended tests will be discussed in this presentation, with details of the successes and challenges in the training on and administration of the sensory screening measures by nurses with residents who have dementia.