Aging with Agency:

Exploring the Impact of Community-Based Walking Programs

Mackenzie McNiven

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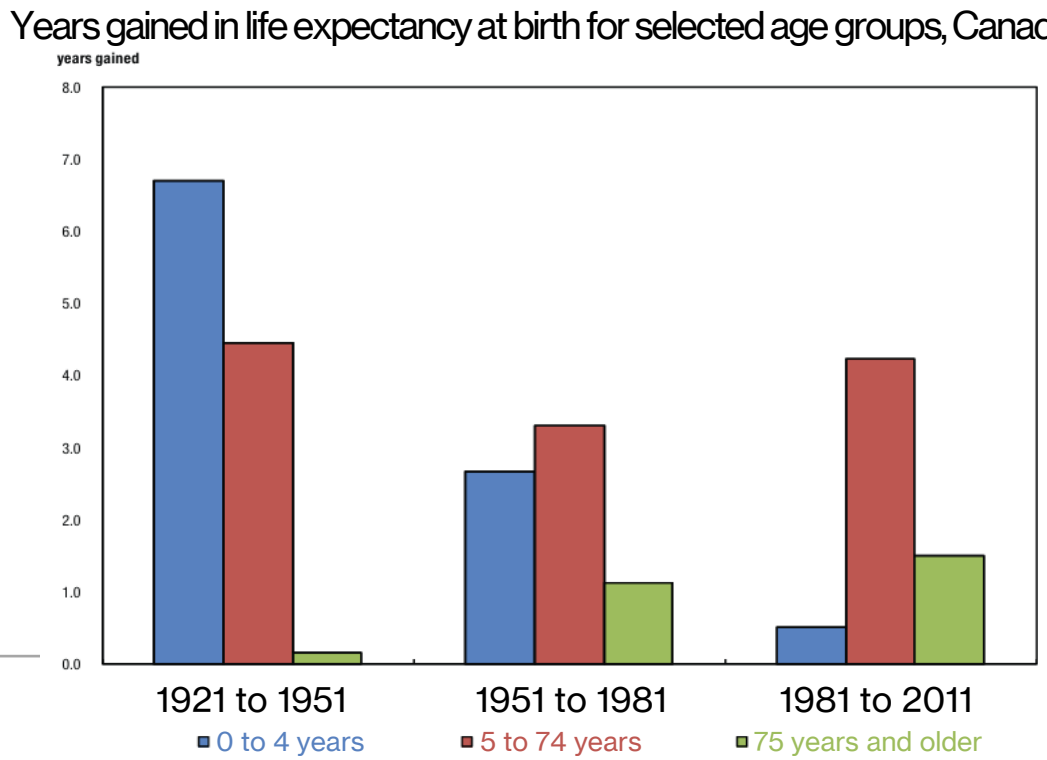
University of Victoria

Average life expectancy in Canada

According to the *Health Statistics Division* in Canada:

- Canadians lived an average of 81.7 years in 2011 (24.6 year increase since 1921)
  - Increases from 1921 – 1951, largely due to reduced infant mortality
  - Increases from 1951 – present, largely due to reduced deaths from circulatory diseases

https://www150.statcan.gc.ca/n1/pub/82-624-x/2014001/article/14009-eng.htm



Average life expectancy in Canada

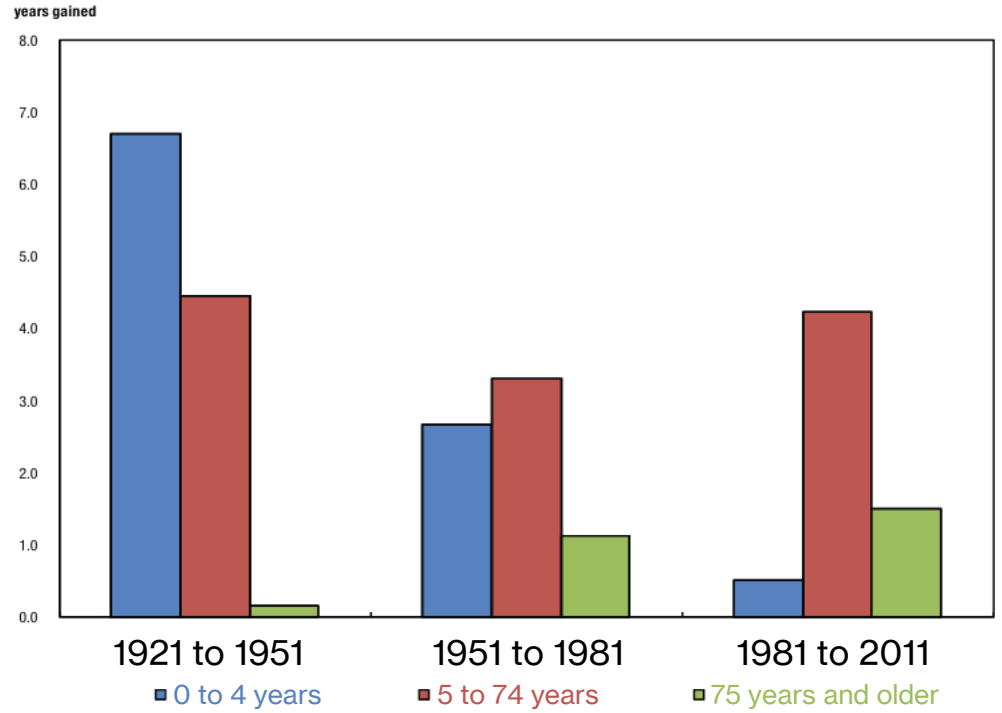
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This means that we are now seeing more people reach ages in which age-related diseases and disorders can be diagnosed

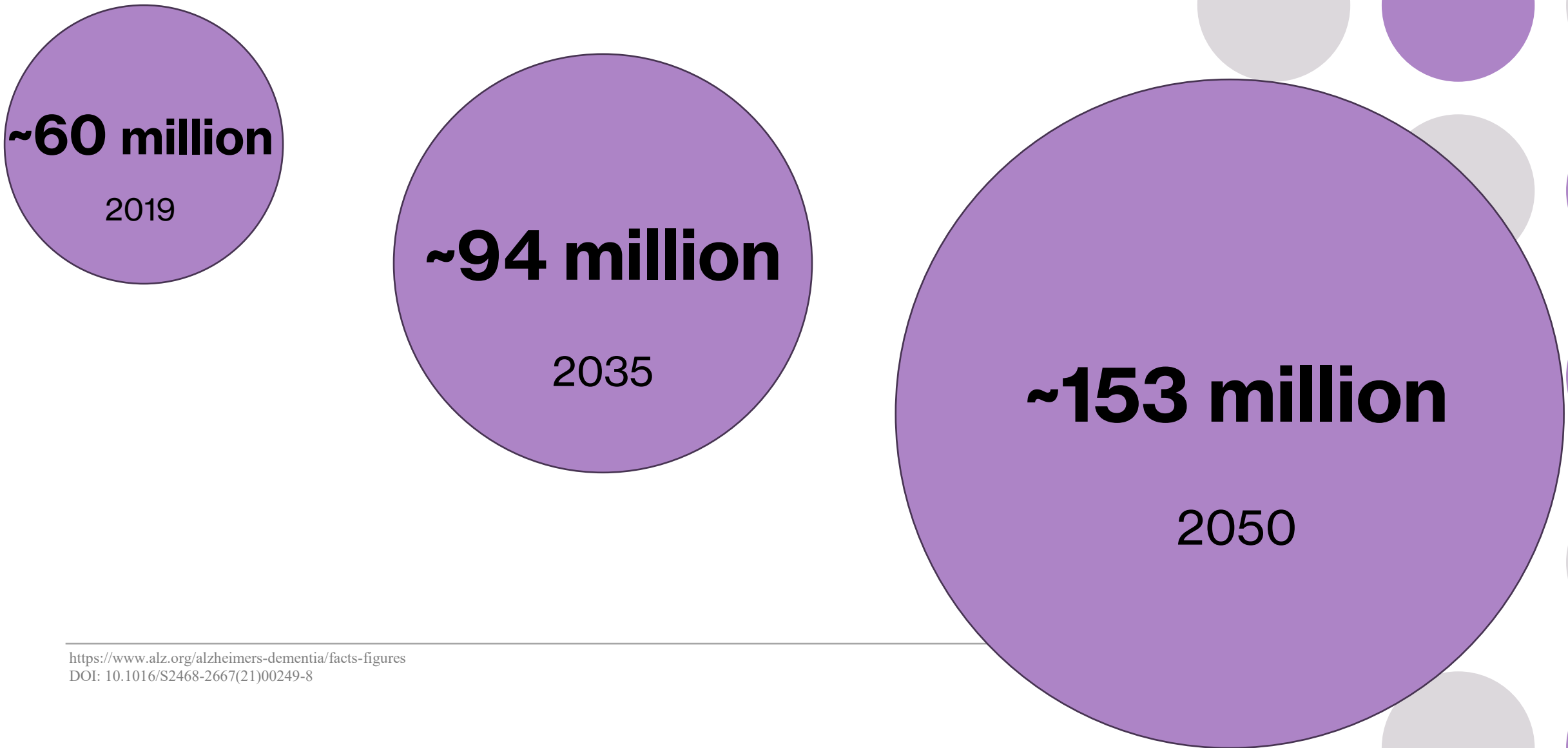
https://www150.statcan.gc.ca/n1/pub/82-624-x/2014001/article/14009-eng.htm

Years gained in life expectancy at birth for selected age groups, Canada



Source: Statistics Canada, Canadian Mortality Database, Canadian Vital Statistics-Deaths.

Global dementia cases



https://www.alz.org/alzheimers-dementia/facts-figures
DOI: 10.1016/S2468-2667(21)00249-8

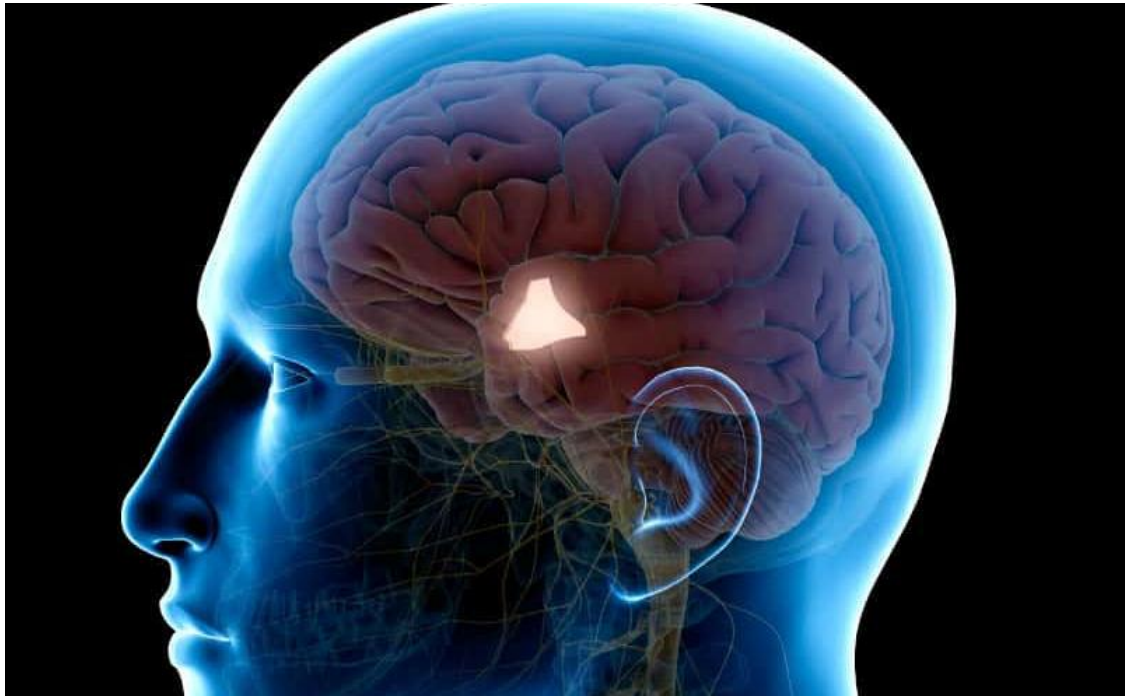
What is dementia?

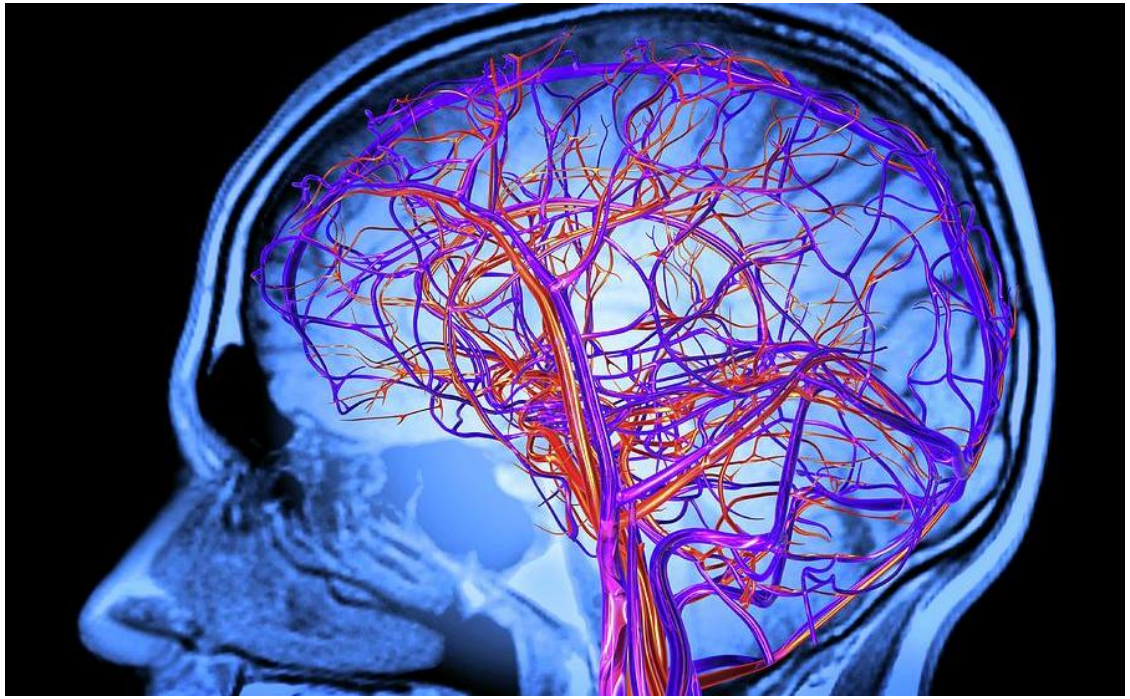
An umbrella term for several different subtypes, many of which cause progressing difficulty with mental tasks including **memory** and **problem solving** often paired with increased **fall risk** (all of which can contribute to **social isolation**). The **4 most common subtypes** are:

- **Alzheimer's Disease** (AD) – accumulation of plaques & neurofibrillary tangles
- **Vascular Dementia** (VaD) – lack of blood flow
- **Lewy Body Dementia** (LBD) – alpha-synuclein deposits
- **Frontotemporal Dementia** (FTD) – focal degeneration

https://www.alzheimers.org.uk/about-dementia/types-dementia

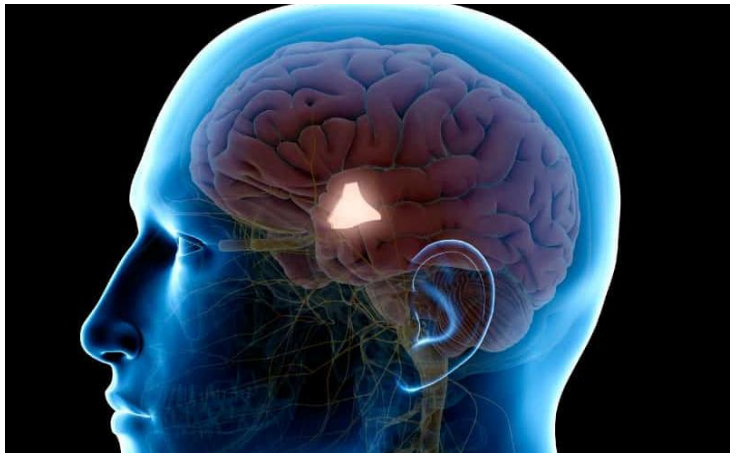
Similarities amongst many dementia subtypes



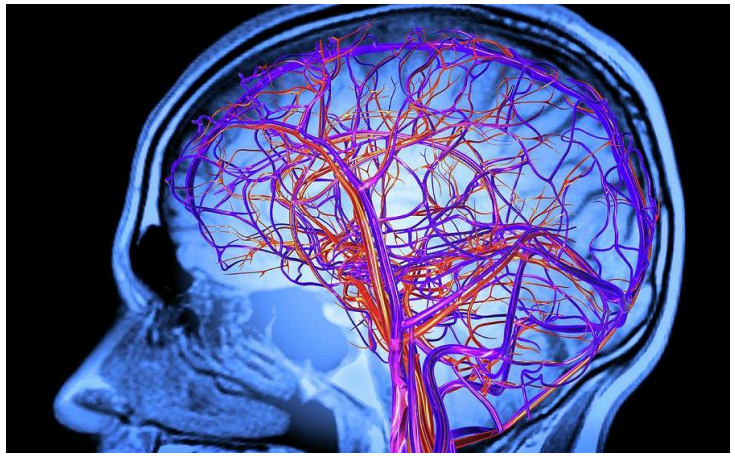


- Changes to the hypothalamus
- Changes in cerebral vascularity

Alzheimer's Disease and Dementia. (n.d.). *Vascular dementia*. Retrieved March 07, 2024 from: https://www.alz.org/alzheimers-dementia/what-is-dementia/types-of-dementia/vascular-dementia#:~:text=Vascular%20brain%20changes%20often%20coexist,the%20likelihood%20of%20dementia%20diagnosis.
Fyfe, I. (2022). Surprise neurovascular dysfunction in frontotemporal dementia. *Nature Reviews Neurology*, *18*(9), 509–509. https://doi.org/10.1038/s41582-022-00705-x
Images from: https://images.app.goo.gl/FNePhBqq6bmdfaon7 * https://images.app.goo.gl/KUJPpR2m4HRF8ePv9



- Changes to the hypothalamus



- Changes in cerebral vascularity

Can we address these ‘similarities’ amongst subtypes?

Alzheimer’s Disease and Dementia. (n.d.). *Vascular dementia*. Retrieved March 07, 2024 from: https://www.alz.org/alzheimers-dementia/what-is-dementia/types-of-dementia/vascular-dementia#:~:text=Vascular%20brain%20changes%20often%20coexist,the%20likelihood%20of%20dementia%20diagnosis.
Fyfe, I. (2022). Surprise neurovascular dysfunction in frontotemporal dementia. *Nature Reviews Neurology*, *18*(9), 509–509. https://doi.org/10.1038/s41582-022-00705-x
Images from: https://images.app.goo.gl/FNePhBqq6bmdfaon7 * https://images.app.goo.gl/KUJPpR2m4HRF8ePv9

Our lab aims to use **lifestyle interventions** (or **social prescription**) to improve wellbeing throughout different stages of life

We do not aim to replace ongoing pharmaceutical work, but rather provide suggestions for ways that people can take agency over their pathway through aging – in the presence or absence of symptoms and/or diagnoses

Areas of research in the BRANCH lab

Areas of research in the BRANCH lab



Voices in Motion

- Community choir involving individuals with dementia, care partners, and youth from local schools
- Found quality of life improvements:
  - Partners experienced significant decreases in measures of caregiver burden
  - Individuals with dementia found an activity that they could participate in equally and found a sense of belonging

This program is ongoing in a non-research capacity within Victoria! (Wednesday and Friday community choir sessions)

Visit **https://voicesinmotionchoirs.org/** to join

MUSIC

Areas of research in the BRANCH lab



MUSIC



LONELINESS



+ SIMILAR EMOTIONAL STATES

Areas of research in the BRANCH lab





LONELINESS
+ SIMILAR EMOTIONAL STATES

"Our research has shown that loneliness and perceived emotional support make significant, measurable impacts on the brain for older healthy adults, demonstrating the importance of prioritizing social connections for health and wellbeing just like you would prioritize exercise and good diet!" Further, recent "findings suggest that how older adults view their future may be particularly important: hopelessness was associated with poorer cognition independently of depression."

~ Samantha Coleborn

Areas of research in the BRANCH lab

Continued:

- **Hopelessness** may be more than simply feeling down about the future. In our study of 7,739 U.S. adults aged 65+, greater hopelessness was associated with poorer cognitive performance in both women and men, even after accounting for depression, loneliness and other aspects of psychological wellness
- Psychological well-being matters for cognitive aging
  - How older adults view their future may be particularly important: hopelessness was associated with poorer cognition independently of depression
- Positive emotions may matter, too!
  - Greater positive affect including feelings of hope and inspiration was associated with better cognitive performance among older women
- Supporting healthy aging may involve more than addressing depression or loneliness;
  - Helping older adults maintain meaningful goals, a sense of possibility, and engagement with the future could be an important direction for supporting cognitive health





L O N E L I N E S S

+ SIMILAR EMOTIONAL STATES

Areas of research in the BRANCH lab



MUSIC



LONELINESS



+ SIMILAR EMOTIONAL STATES



EXERCISE

More info next...

Healthy Bodies
Healthy Minds

My work uses data from a group walking intervention (Healthy Bodies, Healthy Minds) that previously took place in Victoria

Kowalski, K. A. (2014). Effects of a supervised walking program on the cognotive function, gait, fitness, and behaviour of inactive older adults [Doctoral dissertation, University of Victoria]. http://hdl.handle.net/1828/5654

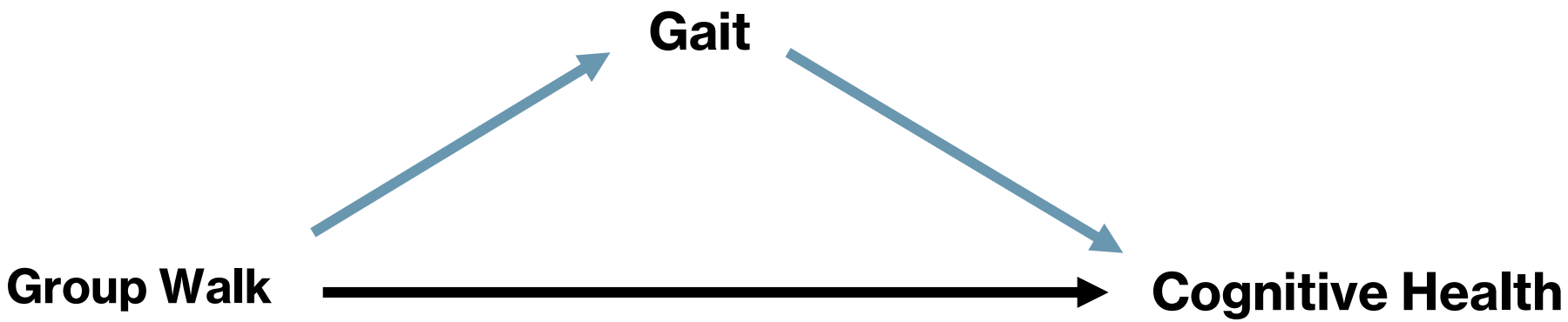
Healthy Bodies Healthy Minds

~300 participants (over 65 years old)

3+ walks per week (guided throughout Greater Victoria)

5x testing sessions at UVic
(baseline, 6, 9, 12, and 16 weeks)

Prior connections established between gait and cognitive health



MacDonald, S. W. S., Hundza, S., Love, J. A., DeCarlo, C. A., Halliday, D. W. R., Brewster, P. W. H., Lukyn, T. V., Camicioli, R., & Dixon, R. A. (2017). Concurrent Indicators of Gait Velocity and Variability Are Associated with 25-Year Cognitive Change: A Retrospective Longitudinal Investigation. *Frontiers in Aging Neuroscience*, *9*, 17. https://doi.org/10.3389/fnagi.2017.00017

My research seeks to understand cardiovascular health as a potential underlying mechanism



Gait

Group Walk



Cognitive Health



HRR

Using a metric called **H**eart **R**ate **R**ecovery to test this

Group exercise intervention

Screening (based on overall health)

↓

Training (to use a perceived exertion scale)

↓

Baseline (tests at UVic)

↓

Participation (voluntary; asked for 3+ session attendance per week)

↓



https://images.app.goo.gl/7MuqEGY1MEZzsx9AA

What are functional biomarkers?

Biological Marker = something that is measured to indicate or identify a biological state, condition, or process in the body

Functional Biological Marker = measures how a biological system or organ performs and responds in action

Gait as a functional biomarker

Single task (walk at a normal pace along an electronic mat)

Dual task (Serial 7's) (walk at a normal pace along an electronic mat while counting backwards from 100 by 7s)



With the GaitRite electronic walkway we collected a series of metrics from each persons walking pattern, including **gait velocity variability (SD)**

https://www.gaitrite.com/

Heart Rate Recovery (HRR) as a functional biomarker

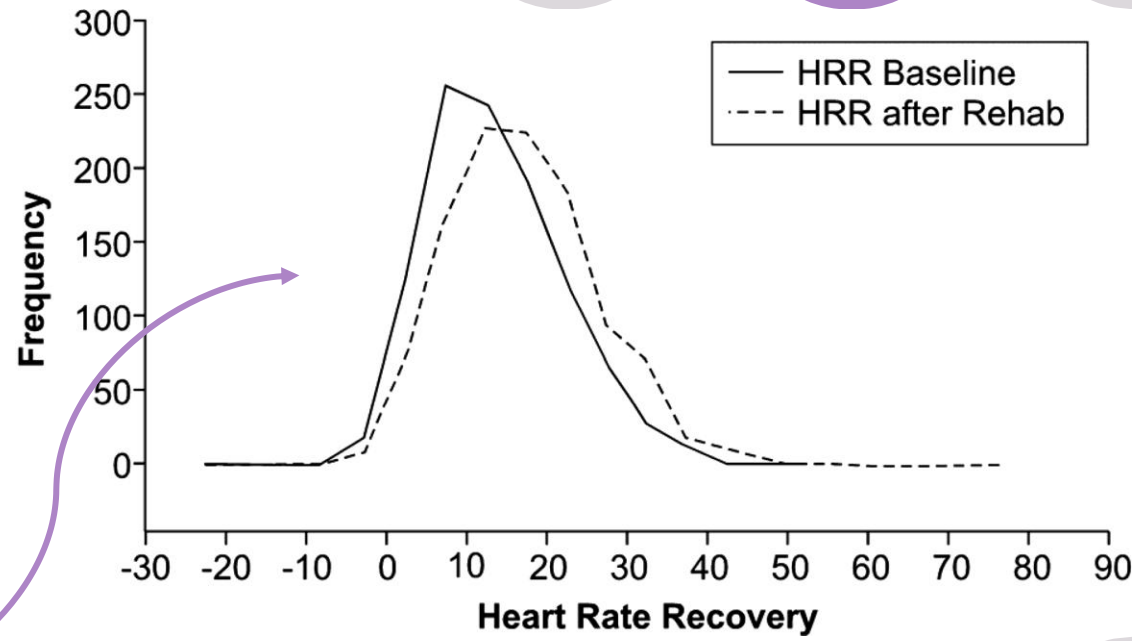
Pre-exercise (resting)

1 min post exercise

3 min post exercise

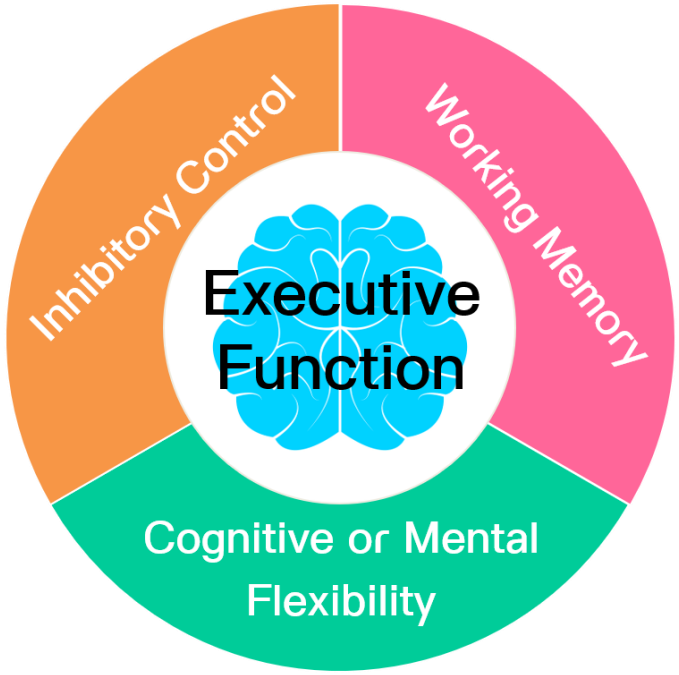
5 min post exercise

We used heart rate recordings at these timepoints to generate a slope that looks something like this



https://images.app.goo.gl/4dekCNY8tiFfud42A

Measuring executive function



We used a series of tests to monitor different aspects of executive function throughout the study

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Research question 1

Do **changes in physiological function** (gait, HRR) shared a time-varying relationship with **changes in cognitive function**?







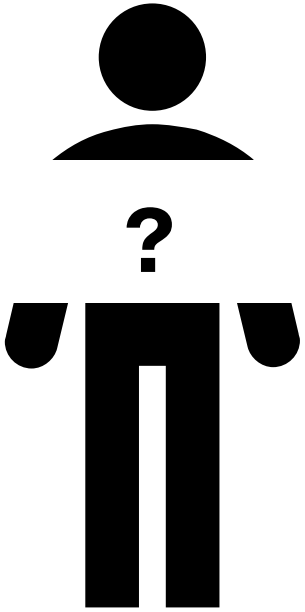
Research question 1 - answered

Do **changes in physiological function** (gait, HRR) shared a time-varying relationship with **changes in cognitive function**?

We saw improvements across several cognitive tests that were correlated with improvements in both gait velocity variability and heart rate recovery

Research question 2

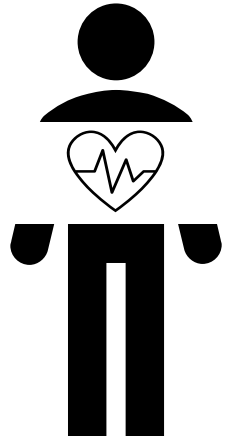
Is the longitudinal time-varying **association between gait and cognitive** function **mediated by HRR**?



Research question 2 - answered

Is the longitudinal time-varying **association between gait and cognitive** function **mediated by HRR**?

As heart rate recovery improved, we found systematic improvements in gait velocity variability and cognition



Summary



Improvements in physiology and cognition throughout the intervention



Attendance frequency was not relevant

(everyone who participated benefitted)



Time varying association between physiology and cognition

Mediated by cardiovascular health

Other considerations



SOCIAL DIMENSIONS

(loneliness commonly co-occurs with sedentary lifestyles)



INDOOR VS. OUTDOOR

(sedentary individuals often spend less time outdoors)



NON-SEDENTARY INDIVIDUALS

(may be a higher intensity threshold for non-sedentary individuals)

Beyond the study – take home advice

Record

Record current activity level (list of activities):

- Activity type
  (anything from grocery shopping to cycling)
- Duration
  (how long did the activity take?)
- Exertion
  (how difficult did you find the activity?)

Add

Add a new activity

Commit to adding something new to your list of activities for at least one month before switching

+ buddy system to stay accountable

Record

Record your activities daily

+ **adapt** as your reported exertion decreases during regular activities

Bonus: record how you feel following exercise

Include wearable technology generated metrics if able

Acknowledgments

Supervisor:
Dr. Stuart MacDonald

Collaborator:
Dr. Nicholas Tamburri

Original investigator:
Dr. Kristina Kowalski

Thank you to all members of the BRANCH lab, and to supportive family and friends

Funding from the University of Victoria and SSHRC.

Extra info: Dr. Stuart MacDonald



Stuart W.S. MacDonald is a cognitive aging researcher whose work examines themes spanning healthy aging, cognitive and brain health, dementia, and aging in place. Combining expertise in gerontology, cognition, longitudinal methodology, quantitative psychology, and neuroscience, his research focuses on understanding the factors that contribute to cognitive resilience and decline across the lifespan, including the role of social connectedness and lifestyle factors. He has made significant contributions to research on longitudinal studies of cognitive aging, dementia, and community-based approaches that support well-being and quality of life among older adults.

- Funded for the past 25 years by both Canadian and international granting agencies
- Has been induction into the Royal Society of Canada's College of New Scholars, Artists and Scientists
- Has served as the National Program Evaluator for the Dementia Friendly Canada Project (AD Society of Canada and Public Health Agency of Canada Dementia Community Investment Grant) and the Age Well at Home Project (AD Society of Canada and the Ministry of Employment and Social Development Canada).

Stuart currently holds the Harald Mohr MD and Wilhelma Mohr MD Research Chair in Adult Development and Aging, is a member of the Research Advisory Council of the Canadian Institute for Social Prescribing, and is a co-PI of an Aspiration 2030 Interdisciplinary Research Cluster on Dementia.

Extra info: related projects

Marie-Lou Gendron, a 4th year undergraduate student at the University of Victoria, worked as an Activity Worker in a non-profit long-term care residential facility in fall 2025 for her co-op position. Marie-Lou organized, facilitated, and evaluated several programs/activities for the physical, intellectual, emotional and social wellbeing of residents living with various physical/cognitive/mental health conditions including dementia, Parkinson's, diabetes, chronic pain, depression, grief, etc. The most impactful project involved bringing Nikki, a volunteer dog owner/trainer and Stevie a trained Black Labrador for visits (particularly in facilities which did not allow pets)

- Pet therapy turned out to be a simple, straight-forward, cost-effective and highly beneficial activity for residents and staff alike
- Visits brought a happy, collaborative ambience that lasted a few hours after the visit, which made any care-aide tasks that followed way easier to accomplish
- As of March 2026, the frequency of dog visits has doubled because of the outstanding positive benefits it continues to provide for residents, staff, families and community
    - Marie-Lou received an Honorary Mention from the University of Victoria and won the Co-op Change-Maker Award for this lifestyle intervention aimed at socio-cognitive health and wellbeing using pet therapy.

Extra info: related projects

Karen Terra is a PhD student in the Social Dimensions of Health program at the University of Victoria. Her research explores the intersections of the arts, particularly drama and theatre, aging, well-being, and quality of life, with a focus on how arts-based activities as Social Prescribing can support people living with dementia.

She has worked with individuals of all ages with disabilities in school and community settings and is deeply committed to bridging academic research and community practice.

Karen advocates for inclusive, arts-based, person-centered approaches to health and well-being.

Check back for upcoming publications!

Extra info!

Our lab:

https://www.uvic.ca/socialsciences/psychology/faculty-staff/faculty-profiles/macdonald-stuart.php

Recent publications:

Coleborn, S.G., Berthiaume, F., Voll, S., Cloutier, D., Dujela, C., Sakamoto, M., Sheets, D.J., Smith,A.P., Gawryluk,J.R., & MacDonald, S.W.S. (2026). Dynamic Coupling Association of Care Partner Quality of Life and Cognitive and Depressive Symptoms Experienced by Persons Living with Dementia. Journal of Dementia and Alzheimer's Disease, 3, 31. https://doi.org/10.3390/jdad3020031

Ohlhauser, L., Kwan, H., Casey, H., MacDonald, S.W.S., & Gawryluk, J.R. (2025). Sex similarities and differences in cognition: A longitudinal study of healthy control participants from the Parkinson Progression Markers Initiative. PLOS ONE 20(11): e0334358. https://doi.org/10.1371/journal.pone.0334358

Schaeffer, M.J., MacDonald, S.W. and Paterson, T.S. (2024). Premorbid personality traits as predictors for incident predementia syndromes: a multistate model approach. *Journal of the International Neuropsychological Society*, 1-11.

Stawski, R.S., Cerino, E.S., & MacDonald, S.W.S. (2026). Associations Among Response Time Inconsistency, Attention Switching, and Cognitive Status: A Measurement Burst Approach. Neuropsychology, 40(3), 229–239. https://doi.org/10.1037/neu0001067

Tamburri, N., McDowell, C., Berthiaume, F., Dujela, C., Gawryluk, J.R., Cloutier, D.S., Sakamoto, M., Smith, A.P., Sheets, D.J., & MacDonald, S.W.S. (2025). Lightening the Load: The Relationship between Gait and Cognition for Persons Living with Dementia Engaged in a Non-Pharmacological Intervention. Brain Sciences, 15(11), 1214. https://doi.org/10.3390/brainsci15111214

Tamburri, N., McDowell, C., Dujela, C., Sakamoto, M., Cloutier, D.S., Gawryluk, J.R., Smith, A.P., Sheets, D.J., Stawski, R.S., & MacDonald, S.W.S. (2025). Choir Mitigates Distress for Caregivers of Those with Dementia: The Voices in Motion Project. American Journal of Alzheimer's Disease and Other Dementias, 40, 1-13. DOI: 10.1177/15333175251395437

Tamburri, N., McDowell, C., & MacDonald, S. W. S. (2022). Parameterizing Practice in a Longitudinal Measurement Burst Design to Dissociate Retest Effects From Developmental Change: Implications for Aging Neuroscience. *Frontiers in aging neuroscience*, *14*, 885621. https://doi.org/10.3389/fnagi.2022.885621