The Role of Physical Activity in the Prevention and Management of Alzheimer's Disease

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Presentation Outline

- Trends and Burdens of Physical Inactivity in Ontario
- Study Design and Methods
- Physical Activity and the Treatment of Alzheimer's Disease
  - Depression
  - Activities of Daily Living
  - Quality of Life
- Physical Activity and the Prevention of Alzheimer's
- Limitations and Conclusions

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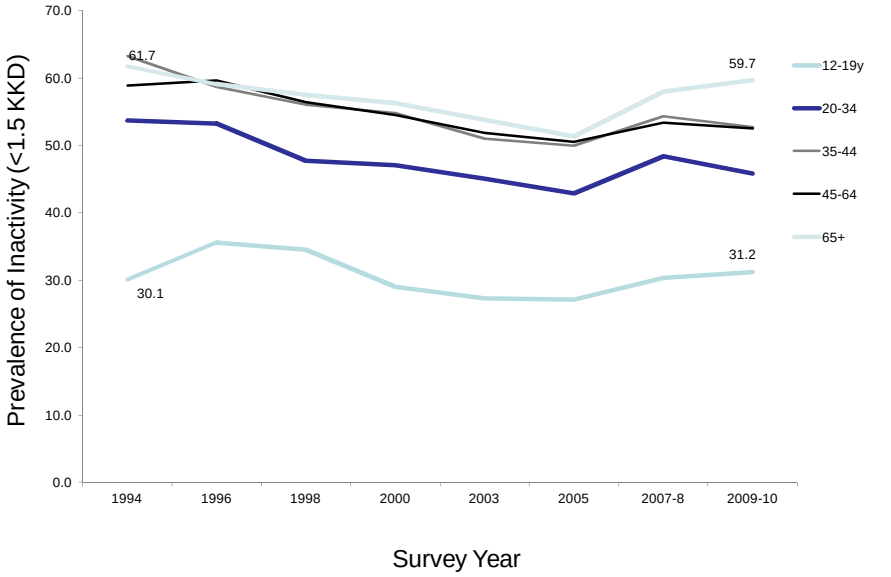
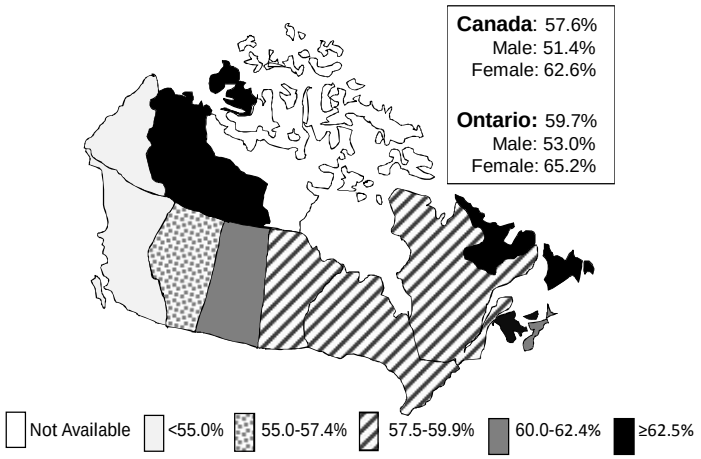
Temporal Trends in Physical Inactivity in Ontario: 1994-2009/10



Data derived from the Canadian Community Health Survey, 2009/2010. Chronic Disease Infobase, Surveillance Division, CCDPC, PHAC. Available at: http://infobase.phac-aspc.gc.ca.

Self-Reported Leisure-Time Physical Inactivity (<1.5KKD) in Canadians (65y+): 2009-2010



Data derived from the Canadian Community Health Survey, 2009/2010.
Chronic Disease Infobase, Surveillance Division, CCDPC, PHAC. Available at: http://infobase.phac-aspc.gc.ca.

Prevalence of Physical Inactivity (<1.5 kcal/kg/day) in Ontario, 65 y+

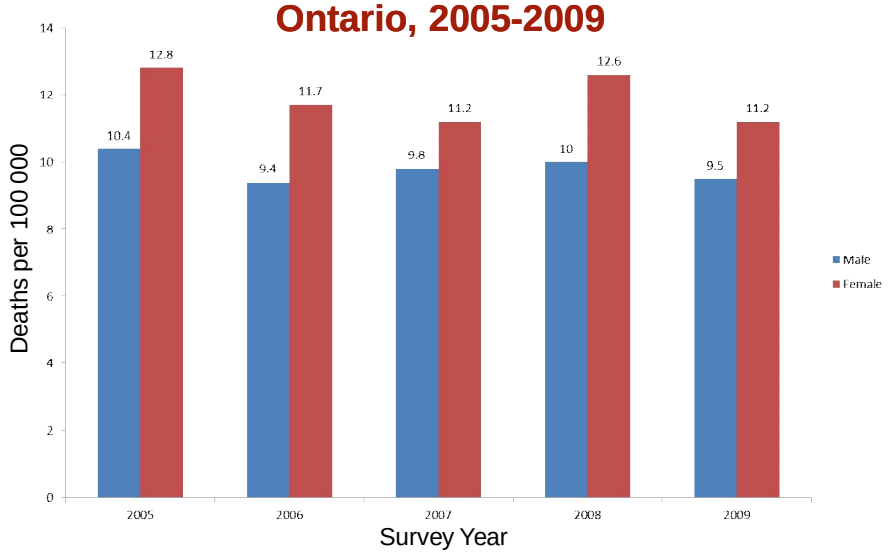
Local Health Integration Networks [Ontario]	% Physically Inactive [≥65 y]
Erie St. Clair Health Integration Network	66.3 (M: 57.3; F:73.0)
South West Health Integration Network	54.4 (M: 48.5; F: 59.0)
Waterloo Wellington Health Integration Network	55.4 (M: 48.7; F: 61.1)
Hamilton Niagara Haldimand Brant Health Integration Network	56.9 (M: 50.0; F: 62.5)
Central West Health Integration Network	60.4 (M: 41.8; F: 72.9)
Mississauga Halton Health Integration Network	58.2 (M: 47.6; F: 66.4)
Toronto Central Health Integration Network	53.9 (M: 42.8; F: 61.9)
Central Health Integration Network	60.1 (M: 55.0; F: 64.8)
Central East Health Integration Network	63.2 (M: 54.1; F: 70.7)
South East Health Integration Network	53.7 (M: 44.4; F: 61.5)
Champlain Health Integration Network	52.2 (M: 45.0; F: 57.9)
North Simcoe Muskoka Health Integration Network	56.7 (M: 47.9; F: 63.6)
North East Health Integration Network	61.2 (M: 54.4; F: 66.4)
North West Health Integration Network	57.6 (M: 48.3; F: 64.9)
Total [Ontario]	58.0 (M: 49.8; F: 64.5)

Data derived from the Canadian Community Health Survey, 2007-8.

Diagnosis of Alzheimer's Disease

Standardized Diagnostic Criteria and Tests for Alzheimer's Disease	Components of Examination
Medical History and Physical Examination	-Family history, changes in activities of daily living, vision, hearing, prescription medication use
Neuropsychological Tests	-Assessment of depression, mental health history, reflexes, coordination, eye movement
Blood Tests	-Assessment of vitamin deficiency, thyroid conditions, etc.
Brain Imaging	-Magnetic Resonance Imaging (MRI): examination of brain for abnormalities associated with Alzheimer's symptoms -Positron Emission Tomography (PET): examination of patterns of brain activity -Single Photon Emission Computerized Tomography (SPECT): blood flow measurement of brain

Age-Standardized Alzheimer's Death Rates (65 y+): Ontario, 2005-2009



Statistics Canada, Canadian Vital Statistics, Death Database and Demography Division. CANSIM table no.: 102-0552.

Background Information

- Randomized Trials
- Prospective Studies
- What's meta-analysis?

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Randomized Trials

- Randomly allocate a person to receive either the treatment or control intervention.

  e.g. A new drug is compared to a placebo in order to reduce hypertension.
- Provides a valid estimate of whether or not the treatment works, since on average, groups are balanced by factors that could affect treatment efficacy.
- "Gold-Standard" way to measure effectiveness.

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Prospective Studies

- Unfortunately, not all interventions can be randomized.

  e.g. it would be unethical to randomize alcohol consumption
- Another valid study design is a *Prospective Study*
- Follow-up a large number of people for a long period of time, measure the risk factor and see who develops the disease.
- The challenge is that studies require long follow-up and cost.

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Meta-analysis

- A statistical technique to combine the results of different studies, typically randomized trials.
- Estimates a weighted average of treatment effects
- Provides an overall "snapshot" of the current literature.
- Cochrane Collaboration – Provides meta-analyses for *thousands* of drugs and health outcomes
  - Recent Cochrane review of Physical Activity for the treatment of Alzheimer's was completed in 2008, however a number of studies have been completed since then.

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Effect Measures

- Standardized Mean Difference
  - Used for Randomized Trials:

  Is Physical Activity effective for treatment of Depression, improving QOL, and improving ADL in Alzheimer's patients?

- Hazard Ratio
  - Used for Prospective Studies:

  Does Physical Activity reduce the risk of developing Alzheimer's?

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Standardized Mean Difference (SMD)

- Allows measurement of effectiveness of Physical Activity in the treatment of Alzheimer's when its measured in different ways in each study.
- For example, Depression was measured using 3 different scales.
  - Beck Depression Inventory
  - Center for Epidemiologic Studies-Depression Scale
  - Montgomery-Asberg Depression Rating Scale

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Hazard Ratio (HR)

- Allows us to determine if Physical Activity is effective at reducing the risk of developing Alzheimer's.
- Quantifies the risk – i.e. A HR of 0.78 corresponds to a 22 % reduction in the risk of developing Alzheimer's between the two groups.

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Physical Activity as Treatment for Alzheimer's Disease

- Objectives and Inclusion Criteria
- Depression
- Activities of Daily Living
- Quality of Life

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Study Objectives

- To examine whether Physical Activity is beneficial for the treatment and management of Alzheimer's Disease.
- To quantify the protective effect of Physical Activity on the development of Alzheimer's Disease.

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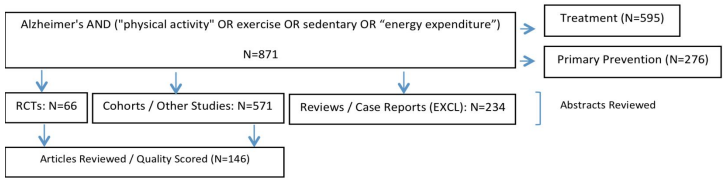
Methodology

- MEDLINE was searched for all relevant studies:



- After searching, 871 studies (abstracts) were initially identified and 146 articles were reviewed and scored.

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Study Inclusion

- After screening, the majority of slides were not eligible for inclusion in this study.

  e.g. outcome not measured, dementia only, etc.

- For these analyses, a total of 21 studies were used across all of the examined outcomes.

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Depression

- Five studies were included in the meta-analysis.
- Each study provided some evidence that Physical Activity was beneficial, but only two were statistically significant.
- The SMD was used as to compare Physical Activity and Control groups.

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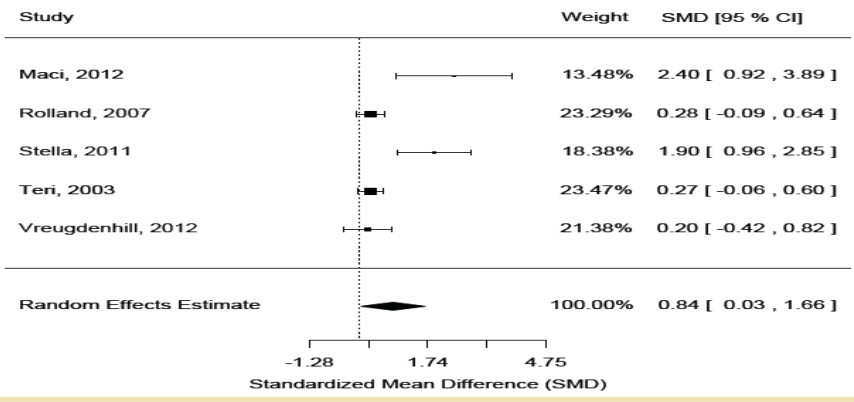
Depression Analysis Results



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Depression: Conclusions

- Physical Activity reduces the burden of depression in older adults who have been diagnosed with Alzheimer's.
- This results is consistent across five randomized trials.

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Activities of Daily Living (ADL)

- ADL is a measurement of basic activities, like bathing, dressing, preparing meals, etc.
- Four studies were combined for this outcome.

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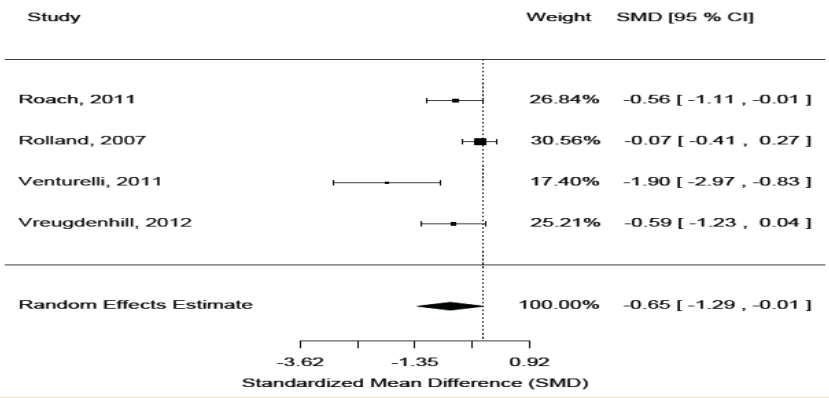
ADL Results



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ADL Conclusions

- The meta-analysis provides evidence that Physical Activity improves Activities of Daily Living.

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Quality of Life - QOL

- Only two randomized trials were available for this analysis.
- Both studies provided evidence that Physical Activity was beneficial.

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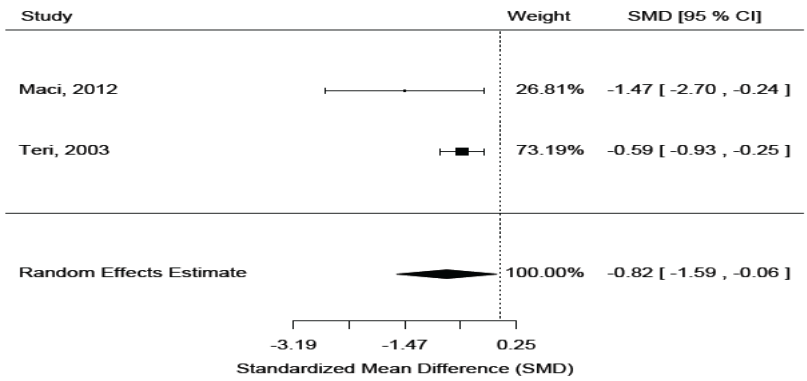
Quality of Life - Results



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Quality of Life - Conclusions

- This analysis provides evidence that physical activity improves overall Quality of Life for patients diagnosed with Alzheimer's Disease.

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Physical Activity and the Prevention of Alzheimer's Disease

- Primary Prevention
- Associated Costs

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Preventing Alzheimer's

- Seven prospective studies were found that examined the impact of Physical Activity on the prevention of Alzheimer's Disease.
- The majority of studies showed that people who were most physically active were at lower risk of developing Alzheimer's.
- The Hazard Ratio (HR) was used to quantify this risk.

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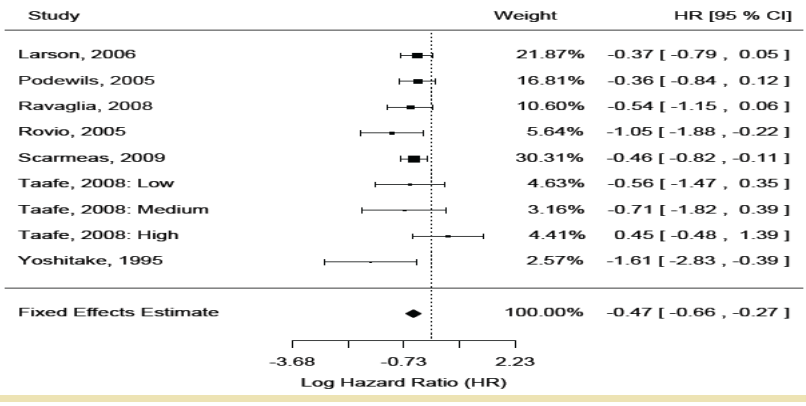
Preventing Alzheimer's: Results



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Preventing Alzheimer's: Conclusions

- People who are physically active ("very active") were 38 % less likely to develop Alzheimer's compared to individuals who were least physically active in each study.

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Potential Human and Financial Cost Savings

- Using this Hazard Ratio, we can show that approximately 1 in 7 cases of Alzheimer's in Ontario can be attributed to inactivity.
- That is, 1 in 7 cases could be prevented through an accumulated energy expenditure of ~1600 kcal/week.
- In addition, if every "Physically Inactive" person became "Physically Active", 15 411 cases of Alzheimer's could be prevented in Ontario alone.

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Canada's Physical Activity Guidelines

Lifespan	Minimum Amount of PA
Children & Youth	•At least 60 mins / day of moderate intensity
Adults	•At least 150 mins / week of moderate intensity · OR At least 90 mins / week of vigorous intensity •Activity can be broken into shorter bouts of at least 10 mins
Older Adults	•At least 150 mins / week of moderate intensity · OR At least 90 mins / week of vigorous intensity •Activity can be broken into shorter bouts of at least 10 mins

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Limitations

- Little information is available for the minimum "dose" of Physical Activity required.
  - Studies used a variety of interventions and measured activity in many different ways.
  - We recommend the Public Health Agency of Canada guidelines of a minimum of 150 minutes of Physical Activity per week.
- Prospective studies focused on people 65 years and older.
  - More information is needed to determine if Physical Activity at age 50 is as effective.
  - The Ontario Health Study will provide additional information on this aspect.

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Conclusions

- In older adults diagnosed with Alzheimer's, Physical Activity reduces the burden of depression, maintains Activities of Daily Living and improves Quality of Life.

- Older adults who are Physically Active are 38 % less likely to develop Alzheimer's Disease. That is, Physical Activity reduces the risk of developing Alzheimer's.

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