Effect of Physical Activity on Cognitive Functioning and Quality of Life in Older Adulthood

A. M. George, M. Ploughman, & L. E. Rohr
School of Human Kinetics and Recreation
Memorial University
Introduction

Adding life to years, not just more years to life.

- Gerontology Society of America
## Canadian Demographics

<table>
<thead>
<tr>
<th>Province</th>
<th>Age 0-14</th>
<th>Age 15-64</th>
<th>Age 65+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada</td>
<td>16.1</td>
<td>68.6</td>
<td>15.3</td>
</tr>
<tr>
<td>Newfoundland and Labrador</td>
<td>14.5</td>
<td>68.4</td>
<td>17.1</td>
</tr>
<tr>
<td>Prince Edward Island</td>
<td>15.8</td>
<td>66.9</td>
<td>17.3</td>
</tr>
<tr>
<td>Nova Scotia</td>
<td>14.3</td>
<td>68.0</td>
<td>17.7</td>
</tr>
<tr>
<td>New Brunswick</td>
<td>14.7</td>
<td>67.7</td>
<td>17.6</td>
</tr>
<tr>
<td>Quebec</td>
<td>15.4</td>
<td>68.0</td>
<td>16.6</td>
</tr>
<tr>
<td>Ontario</td>
<td>16.2</td>
<td>68.6</td>
<td>15.2</td>
</tr>
<tr>
<td>Manitoba</td>
<td>18.7</td>
<td>66.9</td>
<td>14.4</td>
</tr>
<tr>
<td>Saskatchewan</td>
<td>18.8</td>
<td>67.7</td>
<td>14.4</td>
</tr>
<tr>
<td>Alberta</td>
<td>18.2</td>
<td>70.6</td>
<td>11.2</td>
</tr>
<tr>
<td>British Columbia</td>
<td>14.8</td>
<td>68.8</td>
<td>16.4</td>
</tr>
<tr>
<td>Yukon</td>
<td>16.7</td>
<td>73.4</td>
<td>9.9</td>
</tr>
<tr>
<td>Northwest Territories</td>
<td>21.1</td>
<td>72.8</td>
<td>6.1</td>
</tr>
<tr>
<td>Nunavut</td>
<td>30.8</td>
<td>65.7</td>
<td>3.5</td>
</tr>
</tbody>
</table>

(Statistics Canada, 2013)
Cognitive Function

• Cognitive functioning declines with age, eventually resulting in dementia (Lautenschlager, Cox & Kurz, 2010)

• 26.6 million people living with dementia globally (2006 estimate)

• Study conducted using young (age 15-39) and old (40-71) cohorts
  • Younger cohort had better response times, better accuracy and higher WAIS-III scores
  • Individuals that were more active had better response times (regardless of age) (Hillman et al., 2006)

• Meta-analysis looking at effects of aerobic training on cognitive functioning
  • Selective benefits based on fitness training, including executive control
  • Effectiveness based on type of intervention, duration, and gender (Colcombe & Kramer, 2003)
Physical Activity

• Canadian Society for Exercise Physiology (CSEP)
  • Guidelines for physical activity for each age group

• Older adults should attain 150 minutes of moderate- to vigorous-intensity aerobic physical activity per week in bouts of 10 minutes or more (Tremblay et al., 2011)

• Benefits of physical activity:
  • Reduce risk of chronic disease and premature death
  • Maintain functional independence and mobility
  • Improve fitness and improve/maintain body weight
  • Maintain bone health and feel better
Physical Activity

• Study on 349 adults over age 55
  • Used a treadmill protocol and examined peak oxygen consumption and oxygen uptake
  • Measured cognitive function, attention, executive control, and memory
  • Individuals with poorer cardiorespiratory fitness had greater cognitive decline over six years
  
  (Barnes, Yaffle, Satariano & Tager, 2003)

• Meta-analysis looked at effects of physical activity in adults with dementia
  • Studies used cardio fit, strength training, flexibility training, and boot camp
  • Short term and long term interventions both produced significant results
  • Overall, greater physical activity was positive for individuals with cognitive impairment
  
  (Heyn, Abreu & Ottenbacher, 2004)
Quality of Life

- One’s physical, mental, and emotional well being
  (Wilson & Cleary, 1995)

- Conscious cognitive judgment of the level of satisfaction one has with life
  (Rejeski & Mihalko, 2001)

- Related to health, mobility, and functional independence
  (Ozturk et al., 2011)
Health Related Quality of Life (HRQoL)

• How well-being is impacted by disease, disability, and disorders
• Includes:
  • Cognitive function
  • Productivity
  • Symptoms of illness
  • Energy and vitality
  • Pain
  • Self-esteem
  • Body image
  • Sleep and rest

(Rejeski & Mihalko, 2001)
Quality of Life

• Quality of life can be increased through physical activity
  • Positive relationship between physical activity and life satisfaction
    (Rejeski & Mihalko, 2001)

• Link between physical activity and quality of life moderated by mental and health status
  • Study on 249 older women supports social cognitive model relating physical activity and quality of life
    (McAuley et al., 2006)

• 6-month aerobic exercise intervention for seniors with Alzheimer’s disease
  • Trend towards improving cognitive function and quality of life, and reducing depression
    (Yu et al., 2013)
Study Rationale
PROCEDURES
Participants

• Eligibility
  • Self reported memory problems
  • Community-dwelling
  • Able to walk 200 meters unassisted by another person
  • Have a family member/friend willing to provide information

• Participants = 18 older adults
  • 12 Female and 6 Male
  • Age 65 to 79 years ($M = 70.11$, $SD = 4.16$)
  • 72% born in Canada
  • 80% educated beyond high school
Cognitive Ability

• Psychogeriatric Assessment Scale
  • Designed to assess dementia, stroke, and depression based on ‘subject’ and ‘informant’ information scales
    • Subject - Cognitive Impairment Scale (PAS-CI)
    • Informant - Cognitive Decline Scale (PAS-CD)
      (Jorm & Mackinnon, 1995)

• Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE)
  • Designed to screen for dementia in subjects unable to undergo cognitive testing
    (Jorm & Jacomb, 1989)

• Montreal Cognitive Assessment (MoCA)
  • Designed to screen for dementia in subjects unable to undergo cognitive testing
    (Jorm & Jacomb, 1989)
Quality of Life

• **Assessment of Quality of Life (AQoL-8D)**
  - Evaluate quality of life for participants on 8 dimensions
    - Independent living
    - Relationships
    - Self-Worth
    - Mental health
    - Happiness
    - Coping
    - Pain
    - Senses

(Richardson et al., 2011)

• **Qualidem**
  - Measures caregivers rating of resident’s quality of life in residential settings
  - 9 subscales including:
    - Care relationship
    - Positive affect
    - Negative affect
    - Social Relations
    - Positive-self image
    - Restless behavior
    - Social isolation
    - Feeling at home
    - Having something to do

(Ettema, 2007)
Methods

• Baseline questionnaires
  • IQCODE, MoCA, PAS-CI, PAS-CD
  • AQoL-8D, Qualidem

• Follow up at two months, four months, and six months

• Assigned to walk at least 150 minutes per week (CSEP guidelines)
  • Provided with an activity log to record activities for six months
  • Provided with a vivofit activity tracker to use during weeks 1, 14, and 26
Cognition - IQCODE

1 - Much Improved
2 - Somewhat Improved
3 - Not Much Change
4 - Somewhat Worse
5 - Much Worse
Quality of Life - AQoL-8D

- **Overall**
  \[ F(3,21) = 5.544, \ p = .006, \ \eta = .442 \]

- **Physical**
  \[ F(3,21) = 1.625, \ p = .214 \]

- **Mental**
  \[ F(3,21) = 4.588, \ p = .013, \ \eta = .396 \]
Assessment of Quality of Life - 8 Dimension

- Independent Living
- Relationships
- Self-Worth
- Mental Health
- Happiness
- Coping
- Pain
- Senses

Time Point:
- BASELINE
- TWO MONTH
- FOUR MONTH
- SIX MONTH

Score:
- 0.6
- 0.65
- 0.7
- 0.75
- 0.8
- 0.85
- 0.9
- 0.95
- 1

Baseline Quality of Life - AQoL-8D

Score Comparison:
- Independent Living: 0.75 to 0.95
- Relationships: 0.7 to 0.9
- Self-Worth: 0.7 to 0.9
- Mental Health: 0.65 to 0.8
- Happiness: 0.6 to 0.7
- Coping: 0.65 to 0.85
- Pain: 0.6 to 0.75
- Senses: 0.6 to 0.8

Quality of life improves across time points for all dimensions.
Quality of Life - Qualidem

<table>
<thead>
<tr>
<th>Time Point</th>
<th>Care Relationship</th>
<th>Positive Affect</th>
<th>Negative Affect</th>
<th>Restless Behaviour</th>
<th>Positive Self-Image</th>
<th>Social Relations</th>
<th>Social Isolation</th>
<th>Feeling at Home</th>
<th>Having Something to Do</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Month</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Month</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Month</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Score:
- Baseline: Care Relationship - 2.8, Positive Affect - 2.2, Negative Affect - 2.4, Restless Behaviour - 2.6, Positive Self-Image - 2.8, Social Relations - 2.2, Social Isolation - 2.4, Feeling at Home - 2.2, Having Something to Do - 2.4

Time Point:
- Baseline
- 2 Month
- 4 Month
- 6 Month
Discussion

• Greater levels of physical activity help improve circulation, blood flow, and oxygenation

• This benefits the brain as much as any other muscle in the body

• Maintaining cognitive abilities can allow individuals to remain independent in older adulthood

• Good physical and mental health can lead to an overall positive quality of life
Thank you for listening!

Questions? Comments?