

Dementia Phased Pathway: Pre-Clinical Phase Preventing Dementia: The Role of Mental, Social, and Physical Activities

Background:

Brain health is essential to quality of life throughout the life course. There is a growing body of research evidence associating various activity lifestyle factors with the prevention of cognitive decline. Because most of these risk factors are self-manageable, health practitioners are being challenged to re-think a primary and secondary prevention approach to help client's achieve and maintain cognitive vitality in later life.

This edition of "In Focus!" provides key pieces of research evidence that supports mental, social, and physical activity and brain health in aging and makes recommendations for client teaching and self management.

Did you know...?

- There is a strong association between regular engagement in mental, social and physical activities and a reduced risk of developing of cognitive impairment and dementia.
- The mechanism of how mental, social and physical activities reduce the risk of dementia is not clearly understood, and their effects are sometimes difficult to separate. They may be confounding each other, but there is good epidemiological evidence* that regular activity throughout one's life is an effective primary and secondary strategy for brain health.
- Cardiovascular risk factors are dementia risk factors! Cardiovascular disease is preventable.

Key Clinical Messages:

- Assess, educate and encourage clients to develop and maintain lifestyle behaviours that build cognitive reserve by remaining intellectually, socially and physically active. This includes:
 - Continuing life-long learning: Seek opportunities to expand hobbies, learn new skills and knowledge in areas of personal interest;
 - Engaging in regular mental exercise: e.g., reading, crosswords, puzzles, chess and cards, etc.
 - Maintaining active social networks: social disengagement is an independent risk factor for cognitive decline among cognitively intact older persons; Individuals who live alone are especially vulnerable
 - Remaining involved in the community by occupational or voluntary activity
- Physical activities are not only good for the heart, they are good for the brain! Regular moderate physical activity is an independent *protective* risk factor for dementia^{13,14};
- Physical activity can have a beneficial effect on the major cardiovascular risk factors associated with dementias: hypertension, dyslipidemia, obesity, diabetes and insulin resistance, and stroke
Assess, educate and support clients to participate in regular physical activity by:
 - Evaluating current activity levels, barriers and opportunities for activity;
 - Counseling that just 30 minutes of moderate intensity activity at least 3-4 days per week, but preferably on most days is beneficial in reducing cardiovascular risks and improving brain health
 - Advising that 30-minutes of activity can also consist of shorter exercise bouts (minimum of 10 minutes) that are accumulated throughout the day (e.g., walking or cycling to work, raking leaves, walking the dog, etc.); Small, graduated efforts are better than no efforts.

* See page 8 for detailed research evidence supporting these key clinical messages

In Focus! *Towards Clinical Excellence: Evidence-Informed Practice Recommendations for Dementia Care*

Section 1: Why are Activities Important?

The Cognitive Reserve Hypothesis

One of the most prominent theories on dementia and preservation of cognitive function is the Cognitive Reserve (CR) hypothesis. This hypothesis suggests that the variation in individual cognitive abilities arises from innate intelligence¹ and/or life experiences. Depending on the richness of life experiences, such as education², occupation², and leisure (physical, mental and social activities), individuals will vary in their “reserve” of knowledge, and skills at any given point in time. Brain growth is complex, and there is growing evidence to support the notion of critical or sensitive periods throughout the life course, that may lead to risk of dementia in later life. The density of synaptic connections, the number of dendrite branches, and the overall structural and functional “connectedness” of the brain makes a critical contribution to the development of cognitive reserve and brain health.

In relation to dementia, it is hypothesized that these unique brain variations and cognitive abilities assist some individuals to cope with the pathologic changes of dementia better than others, even across different levels of disease severity and greater pathology³. This results in a delayed clinical expression of the dementia, even though neuropathological changes are occurring. By the time that cognitive decline is clinically detectable; the underlying pathology is very advanced. This gives rise to the expression “the more brain you have, the more you have to lose” – cognitive reserve is a mental buffer.

How Activity Affects Cognition

Little is known about the mechanisms of how activity benefits cognition. Some researchers focus on vascular mechanisms³, theorizing that activity slows the reduction in age-related metabolic rate and improves cardiovascular function, thereby enhancing regional cerebral blood flow, perfusion and oxygenation. Some researchers hypothesize that exercise may promote brain plasticity by alleviating the amyloid burden on the brain⁴, while others are investigating neurobiological mechanisms, looking at how activity affects the genetic production of neurotrophic factors, needed for brain maintenance. Despite the uncertainty of mechanisms of action, the epidemiological evidence that regular activity decreases the risk of dementia is persuasive.

The Debate on Activity and Cognition

Randomized control trials looking at the effects of mental, social and physical activity on cognition are non-existent. The best available evidence at this time is large epidemiological studies of prospective design with good follow-up. Critics of this field of research question the confounding influences of the different types of activity upon each other. For example, are the cognitive benefits of an activity such as walking, bowling or dancing due to the physical activity itself, or does it result from the social component of being with others? What influence does activity have on mood, and does a positive mental state derive benefit when it accompanies any of these activities?

Conclusions and Recommendations

There remain many unknowns about the effects of different forms of activity and dementia. But there is sufficient good quality epidemiological evidence to draw some reasoned conclusions. **First**, there is good epidemiological evidence identifying that sedentary lifestyles are both on the rise and negatively associated with chronic disease patterns⁵, particularly cardiovascular-related diseases including hypertension, diabetes and stroke⁶, which are all major risk factors for dementia. **Second**, there is good evidence that regular physical activity improves cardiovascular outcomes, thereby reducing the risk for dementia. **Third**, physical activity has been demonstrated to be an independent *protective* factor for dementia. Therefore, it is reasonable to make practice recommendations that address the various types of activity, their benefits on cognition, and their potential to reduce the risk for various dementias. From a

In Focus! *Towards Clinical Excellence: Evidence-Informed Practice Recommendations for Dementia Care*

client outcome perspective, there is sufficient evidence to make the following recommendations for interdisciplinary clinical practice.

Clinical Practice Recommendations

Clinical practice recommendations are directed at an agency level for planning and management purposes, as well as at an individual client care level. The Strength of Recommendations (**A,B,C**) concerning activity and dementia are noted following each recommendation[†].



Strength of Recommendations Taxonomy

Evidence-based Recommendations are rated as follows:

- A** = consistent and good quality client-oriented evidence;
- B** = inconsistent or limited-quality client-oriented evidence;
- C** = evidence lacking, more research needed; based on expert consensus/usual practice

The SORT research grading tool⁷ emphasizes client-oriented outcomes – outcomes that matter to clients and help them live longer or better lives, including reduced morbidity, mortality or symptoms, improved quality of life and lower cost of health care services. Levels of evidence are ranked 1-3 based on the validity (quality) of the study design. Strengths of recommendations (A to C) are based on grading the quantity and consistency of the studies and their findings. Ratings are listed following each recommendation or group of recommendations as needed.

Clinical Practice Recommendations

I. Recommendations regarding mental and social activities:

1. Education/Training:

- Educate front-line professional staff on the benefits of mental and social activity in preventing dementia and cognitive impairment; **(A)**
- Educate frontline staff to identify and utilize “teachable moments” within episodic health care as teaching opportunities for primary health promotion. (e.g., **assess and promote** individual lifestyle behaviours which build client cognitive reserve by remaining intellectually and socially active. **(A)**)
- Educate front-line professional staff to use a “Readiness to Change” model for health promotion teaching; **(B)**
- Educate front-line professional staff about client teaching approaches which are effective in promoting client behavioural changes to adopt a more active lifestyle. **(B)**

2. Information:

- Provide public health information that remaining intellectually and socially active is important for brain health. **(C)**

[†] Strength of Recommendations are made from conclusions about the amount and quality of level of evidence evaluated using the SORT tool. See IH Dementia website for further details:

<http://inside.interiorhealth.ca/Health+Delivery/Home+Community/Planning+Development/Dementia+Care+Strategy/>, under “Project Tools”

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- Provide information to external recreational partners that social and mental activity is important for brain health (C)
- Support public access to information which promotes and supports regular social activity especially for isolated and vulnerable clients. (C)

3. Program Planning:

- Client Activity programs (e.g. adult or mental health day programs, residential care activity programs, child care programs) use the knowledge that lifelong learning, social engagement and activity/task complexity “builds” Brain Reserve into program planning and design. (A)
- Promote liaison between IH and external community partners (e.g. recreational centers, seniors centers, etc) on creating social opportunities to reach isolated clients (e.g., seniors, physically and mentally disabled, etc.) (C)

4. Provision of Care:

- Assess the number, type and meaningfulness of existing client social supports, connections and activities. (A)
- The decision to adopt healthy lifestyle behaviours rests with individual clients. Health professionals have a role in **educating, supporting and helping** clients to identify opportunities for **self-management** that include:
 - Learning about the important brain health benefits to be gained through regular mental and social/leisure activities; (B)
 - Identifying personally meaningful activities and social connections; (B)
 - Openness to the concept of life-long learning: Active seeking of opportunities to expand hobbies, learn new skills and knowledge in areas of personal interest; (B)
 - Participating in regular mental exercise: e.g., reading, crosswords, puzzles, chess and cards; (B)
 - Maintaining active social networks: social disengagement is an independent risk factor for cognitive decline among cognitively intact older persons; Individuals who live alone are especially vulnerable; (A)
 - Involvement in their community by occupational or voluntary activity.(B)
- Assess mental, physical and environmental barriers to regularly accessing social activity resources and support client to overcome these barriers (e.g., assist with special transportation needs, match new clients with an established “buddy” to support transition, etc.) (C)

II. Recommendations regarding physical activity:

1. Education/Training:

- Educate front-line professional staff on the benefits of physical activity in preventing dementia and cognitive impairment; (A)
- Educate frontline staff to identify and utilize “teachable moments” within episodic health care as teaching opportunities for primary health promotion. (e.g., **assess and promote** individual lifestyle behaviours which integrate physical activity with daily living) (A)
- Educate front-line professional staff about approaches to individualized client assessment and collaborative care planning which encourage safe and effective physical activities into everyday life (e.g., see provision of care details below); (C)
- Educate front-line professional staff to use a “Readiness to Change” model for health promotion teaching; (B)

- Educate front-line professional staff about client teaching approaches which are effective in promoting client behavioural changes to adopt a more active lifestyle. **(B)**

2. Information:

- Promote public information messages that physical activity is important for brain health. **(C)**
- Provide information to external recreational partners that physical activity is important for brain health **(C)**
- Support public access to information which promotes and supports regular physical activity (e.g., Health Line Access) **(C)**

3. Program Planning:

- Design access to programs and client services which make the healthy choice for physical activity, the easy choice (e.g., point of decision-making for stairs vs. elevator) **(C)**
- Support or facilitate access (e.g., transportation) for isolated and vulnerable clients (e.g., seniors, physically and mentally disabled) to participate in appropriate opportunities for physical activity. **(C)**

4. Provision of Care:

- Where possible, the provision of an individualized counseling approach is more useful than general messaging. An individualized approach requires the practitioner to evaluate: **(A)**
 - the individual's current physical activity level (frequency, intensity, duration);
 - physical activity readiness to make changes;
 - their goals for activity;
 - their ability to balance;
 - history of recent falls;
 - any fears of negative effects (muscle soreness, fear of falling, fatigue, dyspnea, etc).
- Providing an individualized plan of graduated activity increase is more successful than general information about the benefits of physical activity. **(A)**
- Advise clients to achieve a minimum of 30 minutes of moderate intensity activity at least 3-4 days per week, but preferably on most days is beneficial in reducing cardiovascular risks; **(A)**
- The 30-minute activity can also consist of shorter exercise bouts (minimum of 10 minutes) that are accumulated throughout the day (e.g., walking or cycling to work, raking leaves or walking the dog); **(B)**
- Health practitioners should develop a current knowledge of, and promote the use of, local community resources and safe opportunities for senior's physical activity that include compensation for seasonal weather, and the demands of geographical terrain; **(B)**
- Health practitioners advocate for a healthy communities approach to physical activity by personally role-modeling heart-healthy lifestyles; **(C)**
- Clients should be advised to speak with the physician first if there are any known cardiac risk factors or other chronic diseases. Physical activity recommendations may be altered for individual variances. For example, with established hypertension, physical activity recommendations should be in accordance with the Canadian guidelines to prevent and control hypertension. **(A)**

In Focus!

Towards Clinical Excellence: Evidence-Informed Practice Recommendations for Dementia Care

Recommended Quality Indicators (measures):

- Positive messaging regarding brain health and mental, social, and physical activity is evident in health promotion materials developed by the IHA.;
- Brain health messages are developed for targeted audiences across the life course.
- There is evidence of integration between existing IH programs (e.g., tobacco cessation, diabetic education, heart health programs, healthy pregnancies, healthy early childhood) and brain health strategies.
- There is evidence of linkage between preventative programs that target common risk factors for chronic diseases such as heart and stroke, diabetes, and dementia between the IH and community partners;
- There is accreditation evidence that prevention measures for dementia are being incorporated in program planning for direct client services (e.g., wellness clinics, health fairs, etc).

Section II: Developing Evidence-Informed Practice Recommendations

The Evidence that Supports these Recommendations

If you are interested in reading more about the body of evidence behind these recommendations, this next section is for you. A brief description of the process and tools used to critically evaluate and grade the research literature is followed by a detailed summary of a few key research pieces describing the associative relationships between mental, social/leisure and physical activity and dementia.

The Process Used to Establish Evidence-Informed Practice Recommendations.

The IH Dementia Clinical Practice Working group is a small interdisciplinary group dedicated to improving dementia care across all care environments in the IH and throughout the journey of dementia. An extensive review of the quantitative and qualitative research literature in two or more data-bases was completed. Critical evaluation, grading and ranking of the quantitative literature[‡], and the use of established criteria for the qualitative research was used. Where there is insufficient evidence due to a lack of research, a consensus of expert interdisciplinary opinion was established.

Rating Scheme for the Level of Evidence and Strength of Recommendation:

The “Strength of Recommendation Taxonomy (SORT) tool[‡] is a new grading scale used by several family medicine and primary care journals, and which emphasizes the use of patient-oriented outcomes – outcomes that matter to patients and help them live longer or better lives, including reduced morbidity, mortality or symptoms, improved quality of life and lower cost of health care services. Levels of evidence are ranked 1-3 based on the validity (quality) of the study design. Strengths of recommendations (A to C) are based on grading the quantity and consistency of the studies and their findings. It is important to note that a finding of inconsistent or limited quality client oriented evidence (SOR B or C) does not indicate evidence of ineffectiveness, but rather reflects that this is an area of developing research and there is currently not enough information to make an A level recommendation. It is important to identify these areas of uncertainty for future research efforts. Further information is available from the following site: <http://www.aafp.org/afp/20040201/548.pdf>

What is the Quality of the Evidence for this Recommendation?

The evidence presented in this Evidence-informed Practice Recommendation represents some of the largest epidemiological prospective design studies available, and provides acceptable rigour to make a Recommendation “A” with regard to the benefits of mental, social and physical activities and their association with reduced risk for dementia and cognitive impairment. With the exception of the Friedland study, all studies were considered level 1 evidence using the SORT taxonomy. Studies were critically evaluated for selection bias, participation rates throughout all phases, and the use of acceptable measures. Despite the prospective design, there are always limitations and confounding variables which could distort the results. However in each of the selected studies, potentially influential variables such as age, sex, education, other chronic conditions and the decedent rate and profile were adjusted for. Here are selected key studies that provide sound epidemiological evidence on activity and cognition.

[‡] Ebell MH, Siwek J, Weiss BD, Woolf SH, Susman J, Ewigman B, & Bowman M. Simplifying the language of evidence to improve patient care: Strength of Recommendation Taxonomy (SORT): A patient-centered approach to grading evidence in the medical literature. *The Journal of Family Practice* 2004;53(2):111-120, available in the public domain from <http://www.aafp.org/afp/20040201/548.pdf>

Key Evidence Reviewed

Dementia and Mentally Stimulating Activity:

- In a prospective longitudinal cohort study (level 1 evidence), Wilson et al⁸ (2002) followed 801 older Catholic nuns, priests, brothers without dementia annually for up to 7 years. Cognitive activities included radio and TV listening, playing games such as cards, checkers crosswords and puzzles, reading books and magazines and going to museums. The results show that a 1-point increase in the cognitive activity score was associated with a 33% reduction in risk of AD (HR[§], 0.67, 95% CI 0.49-0.92), as well as a reduced decline in global cognition (by 47%), working memory (by 60%), and perceptual speed (by 30%), with controls for age, sex, education and baseline cognitive function. The results suggest that frequent participation in cognitively stimulating activities is associated with reduced risk of Alzheimer Disease.
- In a large case-control and co-twin study from the Swedish Twin Registry (level 2 evidence), Andel et al⁹ (2005) found that after controlling for age, gender and level of education (the co-twin design provides control over genetic and familial factors), the greater the complexity of work with people and data, the greater the protection from AD. The findings suggest that greater work complexity, and particularly complex work with people (OR^{**} = 0.78, 95%CI 0.63-0.98) may reduce the risk of AD.
- In a case-control study (level 2 evidence) of 193 people with probable or possible AD case compared to 358 healthy control group members, Friedland et al¹⁰ (2001) investigated the diversity and intensity of activity patterns for intellectual, passive and physical activities during midlife period. They found that the control group was more active during midlife than the control group for all three activity categories, even after controlling for age, gender, income adequacy and education. The increase in time devoted to intellectual activities from early adulthood (20-39) to middle adulthood (40-60) was associated with a significant decrease in the probability of membership in the case group (probable or possible AD). This researcher concluded that inactivity is a risk factor for AD or inactivity is a very early sub-clinical effect of the disease or both.

Dementia and Social/Leisure Activity

- In the 5th wave (phase) of a 2003 prospective cohort study (level 1 evidence), Singh-Manoux and Richards¹¹ investigated the relationship between participation in leisure and social activities entailing high or low cognitive effort and cognitive function in middle age. The leisure activities examined included gardening, visiting friend/relative, going to pubs and social clubs, religious observance, using a home computer, cultural event visits, social indoor games such as cards, bingo, chess, and reading, and listening to music. They found that there was an age- and SES-adjusted association between participation in leisure activities (particularly those associated with higher cognitive activity) or social interaction and better cognitive ability. These authors concluded that participation in cognitively complex or social leisure activities have an independent association with adult cognition, and suggest that seeking mental stimulation may have a beneficial effect on cognition in middle age.

[§] HR = Hazard Ratio. A hazard ratio is used to represent the reduction in the risk of death of treatment compared to control, over the period of follow-up.

^{**} OR = Odds Ratio. An odds ratio is defined as the ratio of the odds of an event occurring in one group to the odds of it occurring in another group. An odds ratio of 1 indicates that the condition or event under study is equally likely in both groups. An odds ratio greater than 1 indicates that the condition of event is more likely in the first group. An odds ratio less than 1 indicates that the condition or event is less likely in the first group. (Wikipedia.org)

- Verghese et al¹² (2003) examined the relationship between leisure activities and the risk of dementia in a prospective cohort study (level 1 evidence) of 469 community based non-demented participants older than 75 years. Over a median follow-up period of 5.1 years, 124 participants developed variable dementias. These researchers found that participation in leisure activities, particularly reading, playing board games, playing musical instruments and dancing, were associated with reduced risk of dementia. A one-point increment in the cognitive-activity scale was significantly associated with a 7% reduced risk of dementia (HR 0.93, 95% CI .90 to .97). The association remained robust even with adjustment for potentially confounding variables (age, sex, education, other chronic health conditions, and even base-line cognitive status - the influence of pre-dementia was thought to possibly reduce participation in leisure activities). Results were similar for both Alzheimer disease and vascular dementia. The researchers concluded that increased participation in leisure activities at baseline was associated with reduced rates of memory decline.

Dementia and Physical Activity:

- In a prospective cohort study (level 1 evidence), Laurin et al¹³ (2001) explored the association between physical activity and the risk of cognitive impairment and dementia. In a two wave, 5 year follow-up of 4,615 community dwellers who participated in the Canadian Study of Health and Aging, these researchers found that, compared with no exercise, high levels of activity (exercise engaged 3 or more times per week at an intensity greater than walking) were associated with reduced risks of cognitive impairment (age-, sex- and education-adjusted OR =0.58, 95% CI 0.41-0.83), Alzheimer Disease (OR = 0.50, 95% CI 0.28-0.90) and dementia of any type (OR =0.63, 95% CI 0.40-0.98). These researchers concluded that regular physical activity could represent an important, potent protective factor for cognitive decline and dementia in the elderly.
- In a large prospective cohort (Nurse Health Study) (level 1 evidence), Weuve et al¹⁴ (2004) examined the long-term benefits of regular physical activity, including walking, on cognition. What they found was that higher levels of long-term regular physical activity were strongly associated with higher levels of cognitive function and less cognitive decline. Specifically, the benefits of greater activity (comparing the upper 4th and 5th quintiles with the lowest quintile) resulted in a 20% lower risk of cognitive impairment and the equivalency to being about 3 years younger in age. The association was not restricted to vigorous activity: walking the equivalent of at least 1.5 hours per week at a 21-30 min/mile pace was also associated with better cognitive performance.
- The second wave (5 year follow-up) of the Canadian Study of Health and Aging¹⁵, (Lindsay et al, 2002) a large population based study conducting a prospective analysis of risk factors for Alzheimer disease (level 1 evidence), found that the beneficial effects of regular physical activity (adjusted for age, sex and education), remained strong and highly significant (OR = 0.69, 95%, CI: 0.50-0.96), and was associated with reduced risks for incident Alzheimer disease. The researchers concluded that regular physical activity could be an important component of a preventative strategy against Alzheimer's and other chronic health conditions.
- In a large prospective study (CAIDE), with a mean follow-up of 21 years, Rovio et al¹⁶ (2005) found that participants in the active group who engaged in leisure-time physical activity at least twice weekly at midlife had a 52% lower odds (OR = 0.48, 95% CI 0.25-0.91) of dementia compared with the sedentary group, and a 62% lower odds of developing AD (OR = 0.38, CI 95%, 0.17-0.85), even after full adjustments for age, sex, education, follow-up time, locomotor disorders, apoE genotype, vascular disorders, smoking and alcohol drinking. The associations were more pronounced in apoE-ε4 carriers.

Clinical Toolkit: Resources for Client Education:

The following websites are full of reliable, helpful information for healthy aging.

1. **Canada's Physical Activity Guide for Older Adults:** website: www.paguide.com/older
Explains why physical activity is important for seniors. It offers tips and easy ways to increase level of activity, improve health and prevent and manage chronic diseases.
2. **Active Living coalitions for Older Adults** (ALCOA) web-site: www.alcoa.ca
Information to help older Canadians to maintain and enhance their well-being and independence through a lifestyle that embraces daily physical activity
3. **Canadian Health Network:** website: www.canadian-health-network.ca/
The Canadian Health Network is a national, non-profit bilingual web-based health information service. It helps Canadians find the information they are looking for on staying healthy and preventing injury and disease. Health info for every body.
4. **Canadian Physiotherapy Association:** website: www.physiotherapy.ca/pdfs/FallsSeniors.pdf
Provides useful information on preventing falls
5. **Seniors Canada Online:** website: www.seniors.gc.ca
This web-site provides a fast and straight forward way for seniors, their families, caregivers and organizations that support seniors to access authoritative and trusted information on a range of seniors' issues and topics.

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