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Physical activity and mild cognitive impairment:

The Moving for Memory program

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Introduction

Being physically active has been linked with positive outcomes for brain health, from cognitive benefits¹ to changes in brain-derived neurotrophic factor (BDNF), which is implicated in neural development and function.² With growing evidence of the benefits, researchers continue to explore the role of physical activity on brain health.³ The positive impact of regular physical activity in mild cognitive impairment (MCI) is one area of research.

Mild cognitive impairment (MCI) is an intermediate stage between the expected cognitive decline of normal aging and the more serious decline that occurs with dementia. MCI can involve problems with memory, language, thinking, and judgment that are more significant than normal age-related changes.⁴ MCI is influenced by many factors, some of which can be modified through lifestyle choices, such as physical activity. Medications, stress, and sleep disruptions are additional reasons individuals may experience cognitive impairment. Research has found that pairing aerobic-based physical activity with cognitive engagement activities can have a positive impact on ones' cognition.^{5,6}

Multiple pathways have been proposed to understand how physical activity impacts cognitive function:

- Reduction of risk factors for cognitive decline (e.g., cardiovascular disease, insulin resistance, hypertension and inflammation);³
- Increase in blood flow to the brain promotes neurogenesis (growth and development of nervous tissue) in areas that control memory and thinking; particularly increases in the size of the hippocampus, which is the area involved with learning and verbal memory;⁷
- Increase of neurotransmitters in the brain, specifically serotonin and norepinephrine, which boosts information processing;⁸

S U M M A R Y

There is evidence to suggest that regular physical activity can have a positive impact on brain health. To support patients experiencing memory changes and decline, the Edmonton Southside Primary Care Network began a pilot project called the Moving for Memory Program.

This article provides an overview of the benefits of physical activity on brain health, as well as their 12-week Moving for Memory Program.

- Some basic animal research models have demonstrated that exercise-induced molecular cascades affect neuroplasticity. These studies looked at brain microenvironments and how physical and cognitive functions (of aged mice) can be restored;³
- Reduction in stress and anxiety, and improvement in mood and sleep.

Moving for Memory Program

Members of the Edmonton Southside Primary Care Network (ESPCN) multidisciplinary team regularly work with the ageing demographic and have found that people are resigned to “mild” memory changes as they age. Memory deficits are often not addressed until they interfere with function and/or there is a diagnosis of MCI or dementia. As the literature reflects, the brain is able to develop new connections via neuroplasticity and can improve and evolve with appropriate stimulation and physical activity.

Program Overview

The ESPCN began the pilot project, *Moving for Memory*, in April 2016 to assist and support patients experiencing memory changes and decline. The goal of the program is to provide a supportive program, as part of the medical home, for people with early memory deficits who do not meet the criteria for existing community programs (e.g., CHOICE program, CRIS program). The program offered an opportunity for patients to attend a supervised physical activity program that would provide physical activity and brain exercise through cognitive engagement in a group environment.

The pilot program was offered once per week over 12 weeks. Each session was an hour and 45 minutes. Three main components were included: physical activity, cognitive engagement, and education. Since research dictates that physical activity is essential to stimulating the brain, all sessions began with physical activity followed by cognitive engagement activities and a short education portion. During the pilot program, it became evident that the demand for this type of program was great, and thus, the ESPCN moved the program to a continuous intake, 10-week program in the Fall of 2016. This change enabled patients to attend more quickly after the program referral was made and enabled participants to continue the program beyond the 10-week period.

Moving for Memory offers patients with an opportunity to attend a supervised physical activity program that also provides cognitive engagement brain exercises.



Program Components

Prior to beginning the program, patients were assessed by a registered nurse and exercise specialist. The registered nurse reviewed each patient's medical history and cognitive screening results, if available, i.e., Montreal Cognitive Assessment (MoCA) and Mini Mental State Evaluation. Each patient completed the EQ5D-5L quality of life survey, where patients self-report on a five-item scale ranging from no issues to severe issues in five dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression.⁹ Participants were asked to rate their current health state on a visual analogue scale from 0 (the worst health imaginable) to 100 (the best health imaginable). The exercise specialist completed three functional assessments: the 6-minute walk test, the sit-to-stand test, and the 4-point balance test.

A multidisciplinary team, including an exercise specialist, occupational therapist, and registered nurse facilitated the program. Each physical activity session was a minimum of 45 minutes, which included some intertwined cognitive exercises.⁷ Subsequently, the participants engaged in 30 minutes of cognitive engagement activities and a 30-minute education session.

Physical Activity

Each week of the program included different types of physical activities. Patients were encouraged to walk for 5-10 minutes at the beginning of each session. For the remaining 35 minutes, physical activities included arm ergometer cycling, agility and balance exercises, Urban Poling/Nordic Walking, and resistance exercises with Therabands or body weight. Opportunities to encourage play and socialization were provided, with one session solely dedicated to moving with balloons and balls. Interval-based and circuit training sessions added variety and challenge as tolerated by the group demographics. During some portions of the physical activity session, patients were also asked to engage their brains by developing lists and spelling words with a partner, taking positional directions, and/or using their non-dominant limb.

Cognitive Engagement

Cognitive engagement activities also changed weekly. These activities allowed for independent work and socialization via partner and small group activities. Topics included spatial awareness, patterning, visual cues, associations, priming, and using your senses. Types of activities included games (i.e., Anomia, Bananagrams, Concept), crosswords, Sudoku, and visual or logic puzzles.

Education

The education sessions were discussion-based on specific topics, such as the five steps to brain health including heart health (i.e., managing blood pressure, cholesterol level, and blood glucose), physical activity, nutrition, cognitive engagement, and social connection/socializing, as well as relaxation techniques, coping with loss and change, medications, and sleep. Specific information was provided on what memory is, how memory works, and normal versus abnormal changes in memory with aging. Although similar to the cognitive engagement activities, education provided a platform for patients to address the medical aspects of their brain health and to discuss factors affecting their overall health.

The Moving for Memory program includes at least 45 minutes of physical activity, 30 minutes of cognitive engagement, and 30 minutes in education sessions.

Patient Demographics

Since the Fall of 2016, the ESPCN has gathered specific demographic and outcome data. The profile of our patients include: 69% female, 50% of patients over 81 years, 47% of patients reporting having a chronic condition, 40% having cognitive impairment, and 40% having trouble walking. Most patients were active outside of their home, which was consistent at the beginning of the program and at the 6-month follow-up.

Outcomes...a Work in Progress

The primary goals of the Moving for Memory program are to improve health and wellness, measure quality of life, gather narratives, provide a seamless transition between programs (e.g., from Moving for Memory to CHOICE based on need), and continue a richer connection to the medical home. Upon completion of the program, each patient repeated the EQ5D-5L quality of life survey and the physical function assessments.

The program is still in its infancy, however, we can provide some initial outcome information based on evaluation results thus far.

Through the evaluation of physical function, we found the distance walked during the 6-minute walk test increased following the program, however the difference was not statistically significant.

The number of sit-to-stands were maintained throughout the program. At baseline, 60% of patients said they exercised at least weekly, and at 6 months, half (52%) reported they increased or maintained their exercise frequency. Only 40% said they continued with physical exercises at home. Participants cited medical conditions or forgetting to exercise as reasons why they did not continue at home after the program.

Socialization was reported as a highlight of the program for many patients in the follow-up phone calls. Nearly all patients were satisfied with the program, and all patients stated they would recommend the program to a friend. Most patients reported that they learned new physical and cognitive exercises. Those who did not learn anything or had not retained what they learned mentioned that they still enjoyed the program. It is evident that the program helped patients connect with peers while learning ways to stay active and improve brain health.

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Other Resources

The Moving for Memory program is limited to patients of the ESPCN, however the Alzheimer Society of Canada offers a similar program called *Minds in Motion*. *Minds in Motion* also focuses on physical activity and cognitive exercises in a group setting.



Summary

Emerging research will continue to provide the best practice for treating those individuals dealing with MCI. Although exactly how physical activity promotes improved cognitive function is unclear at this time, physical activity plus cognitive engagement appears promising. The Moving for Memory program provides patients with an environment where they can be proactive with their brain health and build skills which may have physical and mental benefits. Due to patient feedback, the multidisciplinary team at the ESPCN is developing a program manual and continually making evidence-based modifications to all aspects of the program. As the program continues, it will certainly help bring new insights into ways we can help people with memory concerns.

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