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Mind Over Matter®

VOLUME 15

HELPING YOU PROTECT YOUR BRAIN HEALTH

6 Pillars of *Brain Health*

Too Young *to Worry?*

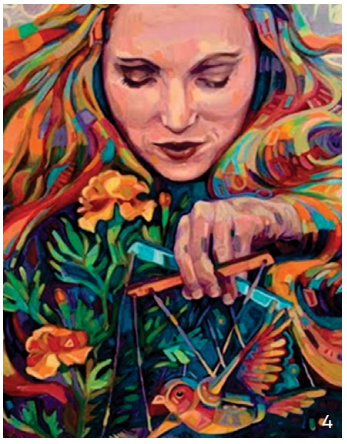
Suddenly *Speechless*

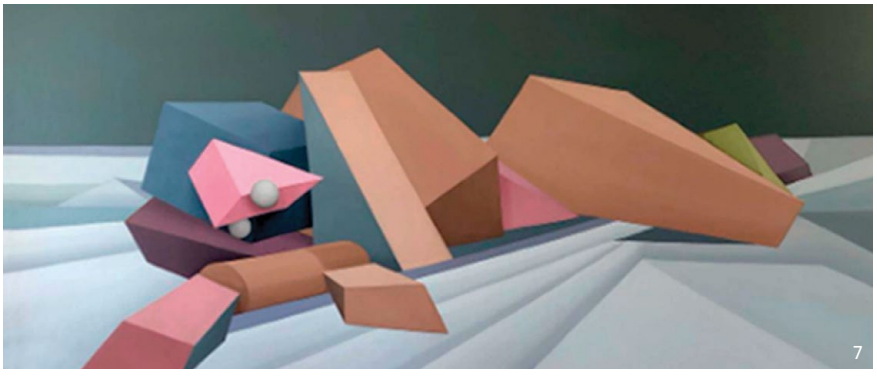
Spring Clean Your Mind

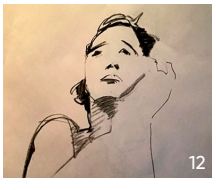
Optimize Your Brain Health

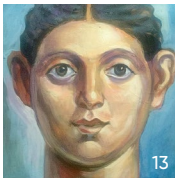
On the *Edge*

Women's Brain Health Initiative









We're All Different and That's Why This Is So Important.

Women are twice as likely to suffer from depression, dementia, and stroke as we age. However, most brain research has not studied the links between sex, gender, and disease. It's time for new, more equitable perspectives. That's why Women's Brain Health Initiative is teaming up with Brain Canada to provide grants that help close the research gap.

ALL OF THE ART ABOVE WAS GENEROUSLY DONATED BY THE ARTISTS IN SUPPORT OF THE BRAIN CANADA-WBHI EXPANSION GRANTS: CONSIDERING SEX AND GENDER PROGRAM.
TO LEARN MORE ABOUT THE ARTISTS, VISIT THE FOLLOWING INSTAGRAM ACCOUNTS:
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Women's Brain Health Initiative | Fondation Brain Canada Foundation

Editor's Letter

As we celebrate the tenth anniversary of Women's Brain Health Initiative (WBHI), three words come to mind: amazement, gratitude, and trust.

I am amazed that in ten short years we have come so far. The seed of an idea took root, grew into a well-respected international charity, and branched out into an important funder of cutting-edge research that better suits women's and families' needs and offers a reliable source of crucial information on preserving brain health.

My gratitude is to many: our ever-growing network of friends, supporters, and donors. The full-time WBHI team is relatively small, but thanks to them and so many others our impact is monumental.

Trust is an invaluable asset that we fervently believe we must earn every day. When you read through the pages of Mind Over Matter® or peruse any of our multimedia educational initiatives, we want you to trust the advice you are receiving. To help us ensure that all of our information is based on the most up-to-date and credible evidence, we rely on a panel of experts with vast and varied knowledge. We encourage you to check them out on the "Experts" page on our website (womensbrainhealth.org/experts).

As I look at the list, I am truly astonished and humbled that such accomplished and brilliant people have so generously lent their talents to WBHI. There are doctors, dementia advocates, nutritionists, and scientists such as the redoubtable Dr. Gillian Einstein, an internationally acclaimed researcher and holder of the Wilfred and Joyce Posluns Chair in Women's Brain Health and Aging at the University of Toronto. There are also caregivers like Ron Beleno, who cared for his father over a decade-long journey with Alzheimer's disease and who is now a passionate advocate for caregivers.

They inform, verify, and often appear in the articles you read in Mind Over Matter®. Thanks to a transformative grant from the Public Health Agency of Canada (PHAC), you can also learn about the best ways to maintain a healthy body and mind by listening to the Mind Over Matter® podcasts and watching our video series, and/or by visiting our newest platform, a mobile application (or app) called "BrainFit."

BrainFit is a wellness app that encourages simple, actionable, and practical habits to help preserve your cognitive vitality. It is the culmination of all the information we have compiled over the past decade and is focused on the "six pillars of brain health" (namely, mental stimulation, exercise, nutrition, social activity, stress management, and sleep). Unlike most other apps, BrainFit is completely free because we are committed to making it accessible to all.

In developing BrainFit, we consulted widely, asking for advice from not only scientists and technology experts, but also from individuals with diverse backgrounds and experiences, including caregivers, Indigenous people, and members of the LGBTQ+ community. The app is currently being tested by a group of more than 100 friends and family and is being evaluated by Dr. Lora Appel of York University (another of our experts). BrainFit - Free Habit Tracker is now available for download from the app store, and I invite all of you to check it out and please let us know what you think.

I must thank the many supporters who made BrainFit possible. Along with PHAC, our partners on this compelling project include York University, BitBakery, TELUS, Home Instead, RBC, RB33, and The Citrine Foundation of Canada.

I cannot tell you how excited we are about BrainFit. Of all the many initiatives over WBHI's ten years, I believe that it has the greatest potential to reach (and teach) more, and to change habits for the better.

Speaking of habits, I invite you to read our article on creating and maintaining healthy habits in this edition of Mind Over Matter®. As you have come to expect from this insightful magazine, we report on some of the most promising research into dementia, highlighting unique risks for women. This edition discusses the brain benefits of both Tai Chi and journaling, as well as provides an update on our annual Stand Ahead® Challenge campaign. We also profile three brilliant researchers who are supported by funding from our wonderful partner, Brain Canada.

Thank you for reading Mind Over Matter® and for believing in us. The best is yet to come!

Wishing you happiness and good health.

Lynn Posluns
President and CEO,
Women's Brain
Health Initiative

PHOTO: JAYLYN TODD

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Contributors

SANDIE BENITAH // WRITER

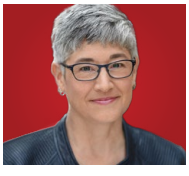
Sandie worked as a journalist in some of Canada's biggest newsrooms for more than 20 years before taking a step back to concentrate on freelancing. The one thing that always drew her to journalism was the lifelong education that came with meeting new people, learning about their struggles, and telling their stories. Writing for Mind Over Matter® has given Sandie a deeper understanding of the importance of brain health and the critical steps both men and women can take to improve their lives.

SUSANNE GAGE // WRITER

Susanne is a marketing/communications agency and events professional, with a solid appreciation for smart thinking. A believer in life balance and healthy body and mind, Susanne is also a passionate advocate for giving back. "As a business woman, wife, mother, daughter, and friend, I am inspired by the impact of WBHI and the collaborative opportunities to make a real difference."

STEPHANIE HAHN // WRITER

Stephanie is a writer and yoga instructor living in Waterloo Region, Ontario. It was through the "gift" of back pain that Stephanie learned to slow down, listen to her body, and rediscover the joys of moving. "Writing for this magazine allowed me to merge my love of writing with my love of spreading the word that stress relief is critical for health."



JANE LANGILLE // WRITER

Jane is a health and medical writer living in Richmond Hill, Ontario who writes for healthcare organizations, hospitals, and academic health research institutions in Canada and the United States. Having seen close family members deal with progressive supranuclear palsy and Parkinson's disease, she enjoys interviewing experts to learn about the latest advances in women's brain health and sharing evidence-based insights.

SEAN MALLEN // WRITER

Sean is a Toronto-based communications consultant, media trainer, and writer. Having seen close family members deal with dementia, he is a passionate supporter of WBHI's mission and is inspired by telling the stories of researchers who are expanding our knowledge of women's brain health. Sean's first book, *Falling for London: A Cautionary Tale* from Dundurn Press, is widely available across North America and the United Kingdom.

DILIA NARDUZZI // WRITER

Dilia is a writer and editor living in Hamilton, Ontario. She has been interested in the benefits of a healthy lifestyle for over twenty years. She studied gender dynamics while doing graduate work at McMaster University and is truly honoured to be using those skills to write for Mind Over Matter®. "I want the medical profession and all women to know that women's bodies require specialized medical care."

SUBHA RAMANATHAN // WRITER

Subha is a director and research consultant for Atmoco Ltd., specializing in health promotion through physical activity. With a PhD in public health, Subha helps non-profits collect relevant information, make research findings understandable, and put recommendations into action. She also teaches a university course in sustainable happiness. Writing for Mind Over Matter® unites Subha's knowledge, skills, and desire to share information and strategies that enhance brain health and overall well-being.

AMY CRYSTAL // CONTRIBUTING EDITOR

Amy is a real estate lawyer at DelZotto, Zorzi LLP, one of Canada's top real estate boutique law firms. "Although many people think of dementia as a disease that affects older adults, the disease begins to impact the brain decades before symptoms are even noticed. WBHI is inspiring a new generation of women to take care of our brain health today, since research now shows that the earlier you protect your brain health, the better the cognitive outcome."

VITINA BLUMENTHAL // CREATIVE DIRECTOR

Vitina, co-founder of Align Creative Minds, is creative to her core with a passion for a healthy lifestyle (especially all things yoga) and sharing her love of mindfulness with others. Through her business, she empowers yoga teachers to spread tools that support brain and mental health.

GREGORY CIRA // CREATIVE DESIGNER

Gregory is an established design entrepreneur with an acuity for information design and understands the importance of communicating clearly. Having had family members who suffered from dementia, he has been inspired to raise awareness of the importance of brain health and uses his visual communication skills to help bring that awareness to others.

COVER PHOTO: JAYLYN TODD

POOJA HANDA & ARUNA HANDA // ON THE COVER

Although broadcaster Pooja Handa has a degree in women's studies, she says she had no idea that women are disproportionately affected by Alzheimer's disease. Becoming active with WBHI has been an eye-opening experience. "I've learned so much. I didn't know that many of these brain-aging diseases can be preventable," she said. She added that appearing with her mother Aruna Handa on the cover of the 15th edition of Mind Over Matter® was both an honour and a special experience they could share. They hope to encourage more conversations about dementia in the South Asian community. "In our community, we didn't talk about it," said Aruna. "I think we should talk about it."

WE ARE TRULY GRATEFUL TO:

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Brain Canada recognizes Women's Brain Health Initiative for its role in educating the public about the importance of women's brain health and the role of prevention, but neither Brain Canada nor the Minister of Health or the Government of Canada are responsible for the accuracy of the contents of this magazine.

The production of this magazine has been made possible in part with the financial support of Health Canada, through the Canada Brain Research Fund, an innovative partnership between the Government of Canada (through Health Canada) and Brain Canada. To date Health Canada has invested over $130 million through the CBRF which has been matched by Brain Canada Foundation and its donors and partners.

Correction: V14 "Interpersonal Psychotherapy" - Cindy Goodman Stulberg is a registered psychologist but does not have a Dr. designation. We regret any confusion this may have caused.

Spring Clean Your Mind

DECLUTTER TO DE-STRESS

Are your bookshelves overflowing or closets bursting? While minimalism may be trendy on social media or in books popularizing the topic, surveys suggest that only 10% of individuals consider themselves to be minimalists (though nearly 25% more aspire to be).

WHAT IS FAR MORE COMMON IS HAVING TOO MANY POSSESSIONS, WITH DIFFERENT SURVEYS FINDING THAT BETWEEN 25% AND 54% OF INDIVIDUALS IDENTIFY CLUTTER AS A PROBLEM IN THEIR HOMES.

At the basic level, clutter is "the overabundance of things people possess," according to Dr. Joseph Ferrari, a Professor of Psychology at DePaul University in Chicago, and an expert in procrastination and clutter. Clutter can be further defined as "surplus stuff that gets in the way and stops you from being who you want to be or doing what you want to do," said Juliet Landau-Pope, a productivity coach and one of the U.K.'s leading organizers, as well as the author of the books *Being More Productive* and *Clearing Your Clutter*.

Landau-Pope points out, though, that clutter is subjective. What may be (or feel like) clutter for one person might be perfectly acceptable for someone else. "There are no rules – it depends entirely on your space, your budget, your temperament, and who you share your home with." In other words, we each have different levels of tolerance to the various items in our space.

> *If 'stuff' is getting in your way, impeding your thoughts, and bringing you down, then clutter is a problem for you.*

Research shows that differences in clutter tolerance can be a major source of tension in shared living spaces. Accordingly, if you are happy with bursting bookshelves but your partner or roommate is not, then you still may very well have a clutter problem.

If you believe that you have a cluttered home and you are concerned that it might be causing you stress, you are probably correct. While the academic research on the psychological consequences of clutter is limited, a recent study conducted by Dr. Ferrari and his colleague Dr. Catherine A. Roster found that as clutter increases, individuals report less life satisfaction and a lower quality of life, as well as more indecision.

It also appears that the relationship between clutter and stress is circular. As Landau-Pope observes,

CLUTTER CAN BE BOTH A SYMPTOM AND A CAUSE OF STRESS.

When there is a change in life circumstances (such as a bereavement, a marriage breakdown, and/or a loss of employment), individuals often lose their motivation to take care of themselves, as well as their environment. Happy circumstances (such as welcoming a child or getting a job promotion) can put a wrinkle in our normal habits as well. Life getting out of hand or becoming unmanageable in some way or another can contribute to clutter.

One of the main reasons why we accumulate so many items in the first place is that we live in a consumer society – i.e., one in which a large part of people's sense of identity and meaning is achieved through the purchase and use of consumer goods and services. We buy goods for a variety of reasons, and much of the time it is not out of pure need. "We live in a culture that tells us more, more, more," observed Dr. Ferrari. "Sometimes we shop when we are tired or anxious, or when we are vulnerable to advertising," added Landau-Pope.

She also noted that many of us purchase presents for birthdays and holidays instead of planning outings with friends and families, and we also tend to return from our travels with souvenirs or bring gifts when visiting someone's home. Additionally, the ability to shop online from the comfort of our homes has made impulse buying that much more common. Now more than ever, it is all too easy to accumulate countless items in your home.

WHY IS IT SO DIFFICULT TO LET THINGS GO?

One of the reasons is that the items we own often become an "extension of who we are," explained Dr. Ferrari. Consumer psychologists have found that when people pick up items while shopping, they are more likely to purchase them. Once these items are brought home, they frequently form part of the collection of the things that makes us who we are.

WE OFTEN CLING TO OUR POSSESSIONS AND THEY BECOME A MAJOR CONTRIBUTOR TO (AND A REFLECTION OF) OUR IDENTITIES.

It is also common to ascribe meaning to certain items in our possession, which then become a connection to our past. "It could be that something links you to your family history or to a particular relationship, occasion, or experience," said Landau-Pope. Our possessions can also be linked to our possible future – something that is aspirational.

For example, you may have art or craft supplies or a mountain of books because these items individually or collectively →

Clutter has a profound effect on our mood and self-esteem, according to researchers at UCLA's Center on Everyday Lives of Families (CELF). Anthropologists, social scientists, and archaeologists at the CELF found:

- A link between high cortisol (stress hormone) levels in female homeowners and a high density of household objects. The more items, the more stress women feel. Men, on the other hand, do not seem bothered by mess, which often accounts for tensions between spouses.
- Women associate a tidy home with a happy and successful family. The more dishes that accumulate in the sink, the more anxious women feel.
- Even families that want to reduce clutter often are emotionally paralyzed when it comes to sorting and pitching objects. They either cannot break sentimental attachments to their possessions or they believe that their things have hidden monetary value.
- Although consumers in the United States bear only 3% of the world's children, they purchase approximately 40% of the world's toys, and these toys occupy every room.

"represent the person you want to be." In these circumstances, it is important to be realistic about what you do (or do not) use or need, Landau-Pope noted. This may involve donating some items, while keeping others. Sometimes knowing that someone else can make better use of the things that you are donating can be very motivating for decluttering.

Sentimental items may require a different approach. For example, a broken teacup that you inherited from your grandmother may be able to be used in a different way – perhaps in the garden as a small planter. However, if repurposing the item is not an option, and you ultimately elect to discard or donate it, then Landau-Pope recommends that you describe your decision as "letting the item go" instead of "getting rid of it." In this circumstance, try to reflect on the memories that you have with your loved one, as opposed to focusing on the possessions you have inherited.

FRAMING YOUR GOALS POSITIVELY

"Instead of thinking about what you're removing, think about what kind of space you'd like to create and try to visualize it," Landau-Pope explained. If you had less clutter around you, would you invite friends over or make a play space for your children? Thinking about how you want your home or life to feel helps you work towards your goal and creates a more enjoyable experience.

IT IS IMPORTANT TO FOCUS ON ONE ITEM OR ROOM AT A TIME IN ORDER TO AVOID FEELING OVERWHELMED.

"Just take the first step. It might be picking up one item of clothing or shredding one piece of paper." When feeling overwhelmed about where to begin, consider choosing a category (e.g., books or clothing) and concentrating on that particular category, instead of tackling the entire bedroom or kitchen, noted Landau-Pope.

If you continue to feel overwhelmed by the "stuff" in your home, then you can take comfort in knowing that there is professional help available. While in-person assistance is common, online support has accelerated during the COVID-19 pandemic. Professional organizers and productivity consultants are trained and sympathetic individuals, and offer a variety of services based on your unique needs.

Although Dr. Ferrari agrees that getting professional help can be useful, not everyone will be able to afford to pay for services. He therefore recommends seeking help from a loved one or friend who can help you determine what you might be "holding on to" instead of "letting go."

He also noted that the popular notion of "touching items to see if they spark joy" may impede the process, in part due to possessions becoming an extension of our selves, as noted earlier. In his opinion, getting someone else to hold up items for review can facilitate the decluttering process. "You are more likely to dispose of something if someone else is touching it," said Dr. Ferrari.

DISTINGUISHING BETWEEN "CLUTTER" AND "DIRTY"

Having clutter can not only make it challenging to clean your home, but may also become "a health and safety hazard, especially for elderly people or those with restricted mobility," said Landau-Pope. However, "a cluttered house can still be a clean house."

There is also an important difference between "clutter" and "hoarding." As Landau-Pope underscores, the latter is "a distinct mental health condition that requires specialist training, usually from multidisciplinary teams."

An organized space can benefit your mental health by making you feel calmer, happier, and more in control. So, if you are looking for an easy way to help reduce stress, decluttering your environment may be a great place to start.

Tai Chi

BOOST YOUR BRAIN & YOUR BODY

Did you know that with the right type of stimulation, your brain can continue to grow new cells, increase the size of existing cells, and even make new neural connections throughout your lifespan?

It is well-established that your brain changes as you progress through various stages of development. Previously, it was believed that the early years (i.e., birth to five years old) were the most critical period to stimulate brain growth.

While it remains true that your brain is approximately 90% of its adult size by the age of five, research over the last two decades has provided solid evidence that brain function and connections can be strengthened well into older adulthood through engaging in Tai Chi and other forms of physical activity.

CONTINUED BRAIN GROWTH IN THE LATTER YEARS IS IMPORTANT AS IT MAY PREVENT OR DELAY THE ONSET OF DEMENTIA. →

Numerous studies have established that physical activity boosts brain health and is particularly beneficial for enhancing cognitive function (i.e., thinking skills) and protecting memory. Moreover, physical activity indirectly assists with cognitive function by improving sleep, enhancing mood, and mitigating the effects of stress and anxiety.

Different forms of exercise appear to have different benefits. For instance, aerobic exercise, that is, steady movement that increases blood flow and makes you sweat (e.g., walking and cycling), has been shown to increase the size of the brain's hippocampus, which is associated with memory and learning.

Strength training (e.g., lifting weights) appears to maintain specific areas of the hippocampus and reduce the rate of degeneration. Tai Chi, a low-intensity physical activity or movement meditation, has been linked to benefits across several areas of the brain, including structural and functional changes beyond what is observed in other forms of exercise.

WHAT IS TAI CHI?

Tai Chi (pronounced "thai-chee") is an internal martial art that synchronizes the body and mind through slow and controlled movements. Also known as "shadowboxing," Tai Chi is characterized by constant low-intensity movements, circular motions, and posture transitions.

It is believed that Tai Chi was developed as a form of self-defence integrated with Yin and Yang philosophies and traditional Chinese medicine. At its essence, Yin and Yang philosophies explain that opposites are complementary. Yin and Yang are symbolized by a black and white swirl, seamlessly fitting together within a circle. In practice, Yin and Yang philosophies translate to the need to have a calm mind to channel explosive strength and power within the body, or balanced stillness to anticipate an opponent's intentions.

Movements are performed slowly when practicing Tai Chi, so that minor adjustments can be made to technique and form, and muscles may be continuously engaged throughout the full range of motion.

There are deep philosophical and advanced forms of Tai Chi. The most popular forms worldwide involve practicing five key elements: single-hand motions (taolu), breathing (neigong), meditation (qigong), pushing motions (tuishou), and striking motions (sanshou).

THESE MINDFUL MOVEMENTS ENHANCE MUSCLE MEMORY, A NEUROLOGICAL PROCESS THAT CONTROLS HOW THE BODY MOVES IN A COORDINATED FASHION WITHOUT CONSCIOUS EFFORT.

In this way, muscle memory may be thought of as instinctive or reflexive movements. Once you can move by instinct or habit, elements like power and speed can be added with less effort.

BENEFITS OF TAI CHI

Practicing Tai Chi involves cognitive components like focus and planning, meditative breathing, mindful movements, and social stimulation (as it is often practiced in groups). A key advantage of adopting Tai Chi for brain stimulation is that it is accessible to people of varying physical abilities and mobility challenges, and it is unlikely to lead to physical injury.

For example, older adults with limited experience in physical activities or pre-existing joint concerns may be safely introduced to Tai Chi. With its focus on balance and muscle activation, Tai Chi can even help to reduce the risk of falling among older adults.

Slow and controlled movements can also alleviate stiff and sore joints that tend to creep in as we get older by lubricating and nourishing the joints with synovial fluid and preventing muscle atrophy (degeneration).

Another realm of benefits relates to meditation and mindfulness, both of which are inherent in the practice of Tai Chi.

This graceful exercise involves deep breathing and slow, focussed movements (often in a predetermined sequence) so that practicing individuals may flow from one posture to another without pause.

BOTH MEDITATION AND MINDFULNESS ARE KNOWN TO ALLEVIATE ANXIETY AND DEPRESSION, AS WELL AS SUPPORT EMOTIONAL REGULATION SO THAT INDIVIDUALS HAVE FEWER NEGATIVE REACTIONS TO STRESSFUL OR CHANGING CIRCUMSTANCES.

Dr. Norman A.S. Farb, an Associate Professor at the University of Toronto, studies the ways that mindfulness meditation can foster resilience against stress. "There aren't many high quality, longitudinal studies on meditation and aging. Yet we know that compared to non-meditators, long-term meditators show less brain atrophy, the slow degradation of the brain that we all

Practiced regularly, Tai Chi can help joint alignment and posture, balance, and proper biomechanics (i.e., good form) and thereby maintain or even increase range of motion whilst reaping brain benefits.

experience as we get older," noted Dr. Farb.

"The strongest evidence, however, isn't about brain structure – it is that meditation helps us to accept the inevitable changes of aging more gracefully. Being able to flexibly adapt to reality allows for clearer thinking and frees us up to enjoy life in the face of changing roles and abilities."

TAI CHI & THE BRAIN

An ever-increasing body of evidence has identified the various ways that Tai Chi boosts brain health. Chunlin Yue and colleagues compared cognitive performance (assessed by the Montreal Cognitive Assessment) and brain structure and brain function (both assessed by magnetic resonance imaging) among healthy older adults who regularly practiced Tai Chi and those who regularly engaged in brisk walking for exercise.

The results of this 2020 study were published in *Frontiers in Aging Neuroscience* and showed better episodic memory (recollection of events and experiences) and gray matter density in the Tai Chi group when compared to the walking group.

BECAUSE TAI CHI IS AN EXERCISE THAT REQUIRES PHYSICAL MOVEMENT WITH COGNITIVE COMPONENTS, IT MAY HELP TO REMODEL THE HIPPOCAMPUS PORTION OF THE BRAIN, WHICH IS ASSOCIATED WITH MEMORY.

In contrast, because walking is a physical movement without specific cognitive demands, it may not stimulate such remodelling.

While findings related to brain benefits of Tai Chi for healthy individuals are encouraging, there is also a growing body of research worldwide showing that Tai Chi may improve cognitive functions for individuals in the early stages of dementia.

A 2019 systematic review published in *Clinical Interventions in Aging* summarized evidence from nine different studies. Overall, the research showed that Tai Chi had positive effects on global cognitive functions and, in particular, visuospatial skills (e.g., building a model with blocks), self-perceptions of memory (e.g., fewer complaints of memory loss), and two specific aspects of memory: semantic memory (e.g., long-term recall of concepts and facts) and verbal learning (e.g., short-term recall of words).

Duration and frequency of practicing Tai Chi varied across the nine studies. In some studies, positive results were seen after just two months of practicing Tai Chi twice a week. Overall, however, there were some mixed results where no differences were observed between the control and Tai Chi groups, though there were no instances where the Tai Chi group fared poorer than the control group.

Karine Hui-Leng Lim and colleagues noted that cognitive improvements were more likely in interventions that were six months or more in duration, and benefits could be maintained up to nine months post-intervention.

YOUR BRAIN BENEFITS THE MOST FROM LONG-TERM, REGULAR PRACTICE OF TAI CHI, BUT YOU WILL STILL SEE POSITIVE EFFECTS EVEN IF YOU MISS SESSIONS OCCASIONALLY.

A 2019 study conducted by Hui Xie and colleagues published in *Scientific Reports* suggests that there may be specific physiological mechanisms in the brain that are activated through regular practice of Tai Chi. Brain imaging data of experienced Tai Chi practitioners and inexperienced control group adults was gathered at rest and during Tai Chi movements using functional near-infrared spectroscopy (fNIRS).

The control group took part in Tai Chi classes for one week to learn the basic movements used during data collection. The researchers examined blood oxygen concentration in the brain and coordination of brain function during rest and movement.

An interesting finding was that the experienced Tai Chi group maintained deeper and more stable oxygen supply to the brain during rest and movement when compared to the control group. Imaging also showed that there was better synergy (coordination) in brain activity across the left and right sides of the brain and anterior-posterior ends (front and back) within the Tai Chi group.

When taken together, research suggests that regular practice of Tai Chi may be beneficial to cognition and delay dementia by providing steady oxygen supply to the brain and enhancing the coordination of neurological processes.

Overall, there is compelling evidence that regular practice of Tai Chi can lead to the wide range of benefits associated with other forms of physical activity, as well as boost brain function, coordination, growth, and mindset.

With accessible movements for a range of physical abilities, and classes offered in many community centres, libraries, and even healthcare facilities, Tai Chi is well worth trying, even if it is just for a few months.

The Right Balance

RECRUITING WOMEN FOR RESEARCH STUDIES

To see Edna Nickie stride purposely through the halls of Toronto Rehabilitation Institute (TRI) and confidently step onto a treadmill, you would never know that only a few months earlier she had difficulty speaking and was unable to tie her own shoelaces. In the fall of 2021, at the age of 78, she suffered a heart attack, followed by a stroke.

"I was shocked. I thought I was living a very healthy lifestyle in terms of exercise and diet, and I couldn't believe that this happened to me. I still can't," said Nickie.

STROKE IS OFTEN THOUGHT OF AS A CONDITION THAT MORE COMMONLY AFFECTS OLDER MEN, BUT IN FACT IT AFFECTS THE SEXES IN EQUAL NUMBERS.

Nickie's initial shock ultimately gave way to determination. Through a physiotherapist, she learned of a study at TRI where researchers were exploring the benefits of engaging in physical exercise to help recover from stroke, and she volunteered to take part.

"It was important for me to recover my physical and mental capabilities for the quality of life that I have left. I'm determined to dance at my ten-year-old granddaughter's wedding one day," she said in an interview with Mind Over Matter® at TRI's Rumsey Centre, just before one of her thrice-weekly sessions.

In the process, she was also making an important contribution to science, helping researchers better understand how to help other stroke survivors.

Sitting opposite Nickie was the very grateful leader of the project, Dr. Susan Marzolini, a researcher at the University Health Network's KITE Research Institute and a scientist in the Cardiovascular Prevention and Rehabilitation Program.

"I do believe Edna is very special, and incredibly inspirational to others as well," she said. Dr. Marzolini appreciated not only Nickie's example, but also her presence.

IT SPEAKS TO A TROUBLING CHALLENGE FACED BY SCIENTISTS STUDYING STROKE: FINDING WOMEN WILLING TO PARTICIPATE IN RESEARCH PROJECTS.

In Dr. Marzolini's recent studies, only 30% of the volunteers were female. This is particularly problematic in light of the fact that the incidence of stroke is evenly split among women and men.

The researchers' goal is to develop findings that are applicable to both sexes, and in order to accomplish this it is critical to have a study group that reflects the prevalence of stroke in the general population.

"These trials have the potential to change how we treat people, and they guide our clinical practice guidelines. They're just so important and we need equal representation," she said.

Dr. Marzolini is one of the leaders of a new research project called "EMPOW-HER," funded by Brain Canada and Women's Brain Health Initiative, and made possible through the Canada Brain Research Fund (CBRF), Brain Canada's partnership with the Government of Canada, →

which seeks to find out why women are not volunteering in sufficient numbers and to propose solutions to increase recruitment.

As part of EMPOW-HER, a questionnaire will be presented to a cross section of individuals who have had a stroke, with the goal of determining what aspects of research studies make it easier (or more difficult) to volunteer. The researchers will compare their findings to what is known about the general population of people who have suffered strokes.

The EMPOW-HER team, including Dr. Mark Bayley of the KITE Research Institute, will develop a series of strategies that they will test in focus groups to see if they improve the balance of participation.

"The goal is to recruit people into studies who look like the people who have the disease," explained Dr. Amy Yu, Assistant Professor in the Department of Medicine at the University of Toronto.

There are a variety of theories as to why women are reluctant to participate.

Although women suffer from stroke at approximately the same rate as men, they tend to be older and the effects more severe. They are also more prone to depression, which could affect motivation.

Additionally, women often require more time to consider their decision and more opportunity to consult with family members and friends. Some evidence suggests that compared to their male counterparts, women may be more concerned about possible adverse consequences and face a variety of practical barriers, such as lack of transportation to research facilities.

Even Edna Nickie noted that she had some initial reluctance in participating, given the severity of the impact of her stroke. She added, though, that she had the tremendous advantage of having her husband drive her to her appointments, three times a week over a six-month period.

Dr. Shannon MacDonald, a physical medicine and rehabilitation specialist at Sinai Health, who is also contributing to EMPOW-HER, noted that the study may lead to changes in how researchers design their projects.

"Maybe we have to change our approach to patients. Maybe we need to change the information we're giving them to help them to make an informed decision about whether they want to participate or not," she said.

Although researchers carefully design the criteria for participation in studies to ensure that their research generates accurate results (for example, by imposing an age limit), Dr. MacDonald believes that the guidelines may be too narrow. Since women tend to be older when they have a stroke, they should not be automatically disqualified from a study merely because they are over the age of 80 or 85.

"Do we really need to exclude people because of X or Y? Are we being a little too strict at times in terms of who we're including?"

THE EMPOW-HER PROJECT PLANS TO DEVELOP TRAINING MODULES FOR EMERGING RESEARCHERS SO THAT THEY CAN USE RECRUITMENT METHODS THAT WILL PRODUCE A MORE BALANCED POOL OF PARTICIPANTS.

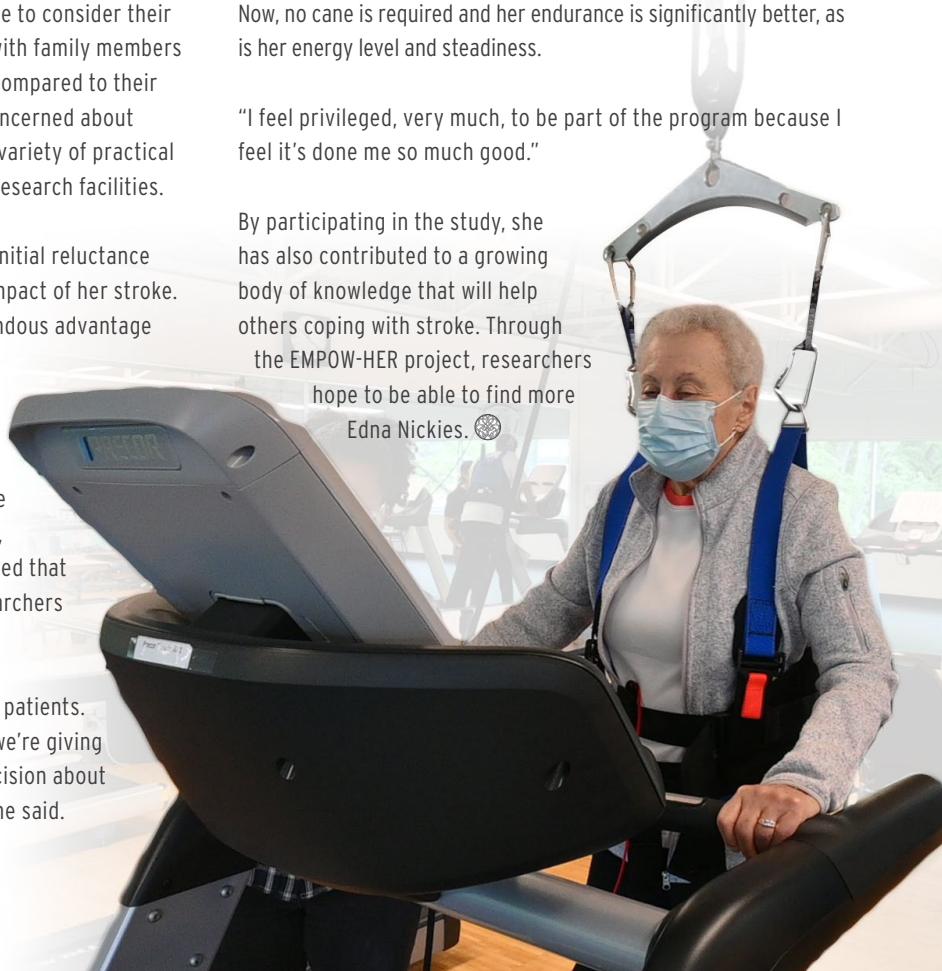
Dr. Marzolini believes that this could lead to better science and to better results for women who have suffered from a stroke.

"If we're not getting the accurate information, if the results are not generalizable to women and men, then women are not getting the treatment that might improve their outcome," she said.

For Edna Nickie, volunteering for Dr. Marzolini's stroke rehabilitation study at TRI led to a strong recovery after a devastating health event. When Nickie first arrived, she needed to use a cane to walk. Now, no cane is required and her endurance is significantly better, as is her energy level and steadiness.

"I feel privileged, very much, to be part of the program because I feel it's done me so much good."

By participating in the study, she has also contributed to a growing body of knowledge that will help others coping with stroke. Through the EMPOW-HER project, researchers hope to be able to find more Edna Nickies.



Mother Load

MATERNAL MENTAL HEALTH

Access to mental health care was a major issue long before COVID-19, but the pandemic placed new and extraordinary stresses on the system. Women suffering from postpartum depression were among those facing additional barriers. British Columbia's Ministry of Health reported a surge in demand from new mothers for mental health care, along with a resultant increase in waitlists. An ongoing research study out of the University of Calgary suggests that more new mothers are struggling with postpartum anxiety and depression in the first three months after giving birth than prior to the pandemic. →

In the wake of these troubling trends comes a research project that seeks to bring a readily accessible means of mental health support to new mothers and their children.

Dr. Catherine Lebel of the University of Calgary and her colleagues are testing a mobile application (or app) known as "BEAM" (Building Emotional Awareness and Mental Health), which takes women through a ten-week, structured program designed to help alleviate the symptoms of postpartum depression.

"What we're hoping to find with the app is that actually there are relatively simple ways to support people through this transition period," said Dr. Lebel, an Associate Professor of Radiology.

SMART PHONE OR TABLET-BASED APP

The BEAM app takes new mothers through a series of videos and connects them with a clinically trained coach with advice and strategies for dealing with the stresses of caring for a child. Those who exhibit signs of more serious depression or anxiety receive a referral for one-on-one therapy. The approach requires far fewer resources than typical clinical care and, crucially, can reach much more people.

"Because it's delivered by an app, it means that it can be delivered anywhere," Dr. Lebel told Mind Over Matter® in a phone interview from her Calgary office.

"It's easier to deliver than a traditional therapy model. People are still getting access to evidence-based information and resources, and they're connecting with people who've experienced postpartum depression as well and they're led through it by a psychologist. But it's not as resource intensive for either side as a traditional therapy model."

Developed by Dr. Lianne Tomfohr-Madsen of the University of British Columbia and Dr. Leslie E. Roos of the University of Manitoba, the app has already been tested on a pilot basis in a couple of different studies.

Based on the feedback received, the research team is making some refinements to the app and plans to conduct a study within the next few months, funded by the Bell Let's Talk - Brain Canada Mental Health Research program, a pillar of Brain Canada's Mental Health Research Initiative, to test its efficacy. As part of the project, which is made possible through the Canada Brain Research Fund (CBRF), Brain Canada's partnership with the Government of Canada, the researchers will not only be observing the progress of the mothers, but also any behavioural changes in the children.

A 2019 Statistics Canada study indicated that nearly a quarter of women who had recently given birth reported feelings of postpartum depression or anxiety, with the rates higher among mothers under the age of 25.

The "Pregnancy During the Pandemic" study asks each participant to complete a questionnaire at various points during pregnancy, as well as after delivery and during the first few weeks of a child's life. In optional follow-up studies, researchers will be collecting hair and saliva samples to learn more about the ways in which stress affects biological indicators of stress in pregnant women and their babies.

"Our hypothesis is that the program will improve the mother's mental health, and by proxy will improve the kid's behaviour and brain development," said Dr. Lebel.

STUDYING PANDEMIC STRESSES

Dr. Lebel's research focuses on many aspects of the mental health of mothers and their babies – both postpartum and during pregnancy. Coinciding with the development of the app is a study out of the University of Calgary involving approximately 10,000 women from across the country, which will explore how the stresses of the COVID-19 pandemic affected pregnant women and their children.

"We hope to study them as long as they'll let us. We've seen massively increased stress during the pandemic. It will be interesting to see what we can learn about the long-term effects," said Dr. Lebel.

IMPACTS OF PRENATAL DEPRESSION

The study builds upon Dr. Lebel's earlier research of an area that is less studied than postpartum depression: the effects on children whose mothers suffer depression during pregnancy. While it had been well-established that alcohol and drug abuse during pregnancy can have serious long-term impacts on the baby, Dr. Lebel's work revealed that prenatal depression also has an adverse effect.

"I think it has been underrecognized. I feel like moms don't get as much care as they deserve when pregnant because of all the attention on the baby. But it's a significant problem for a lot of reasons."

Dr. Lebel scanned the brains of children of women who had symptoms of depression during pregnancy and found that they had a thinner cortex (the grey matter on the outside of the brain), which could affect children's learning and behaviour. The research team also found that boys exposed to higher depression in utero had more hyperactive behaviour, which was related to altered brain

connectivity. The observed brain changes may be one reason why children exposed to depression in utero are more likely to have depression themselves later in life.

"We can't fully connect those dots yet," said Dr. Lebel. "But it's logical that the brain changes we see that seem to be a result of prenatal depression are likely to make children more vulnerable. Certainly not every person whose mother had depression in pregnancy is going to have depression as well, but these brain changes are probably making children more vulnerable."

A question that remains is whether these impacts will be felt later in life in other ways, such as elevated risk of dementia. The participants are still children and will have to be observed over a much longer period of time to find those answers.

Dr. Lebel believes that this is an area worthy of further research. It is critical for mothers to be healthy and well, and we could do much more to help them, both during pregnancy and after the birth of their children.

"It would be really nice if mental health supports were more accessible. I think we could do a lot of good for women, for moms, for children, and for families."

iTech

TOO MUCH OF A GOOD THING

CAN BE BAD FOR YOUR BRAIN

Over the past three decades, our daily lives have changed dramatically as various digital technologies have been invented and become widely used. People of all ages are using devices such as computers, tablets, and smartphones to readily access vast amounts of information and entertainment, and to connect with others virtually or online. Many of us are using these devices for large portions of each day.

This digital revolution certainly has made life easier and more enjoyable in many ways – for example, by having the ability to use your smartphone to help you navigate while driving, or to look up a well-rated recipe that uses ingredients that you already have on hand, or to make a video call with friends and family during pandemic lockdowns.

Although digital technologies can provide benefits to our health and well-being, the impact is not all positive.

> **EXCESSIVE USE OF SCREENED DEVICES HAS BEEN LINKED WITH A MYRIAD OF NEGATIVE OUTCOMES – PHYSICAL, SOCIAL, EMOTIONAL, AND COGNITIVE – AND THERE IS MUCH WE STILL DO NOT KNOW ABOUT THE LONG-TERM IMPACTS.**

THE NEGATIVE EFFECTS OF TOO MUCH SCREEN TIME ON BRAIN HEALTH

A recent academic paper by Dr. Gary Small and colleagues reviewed available research on the brain health consequences of digital technology use and concluded that frequent use significantly

Multitasking is a term used to describe doing multiple tasks or activities at once, e.g., doing homework while listening to music and responding to text messages. Complex multitasking with various technological tools is quite common these days among young people and adults and may be contributing to difficulty with focus.

Research has demonstrated that when we attempt to do multiple complex things at once, the tasks are not actually happening simultaneously, but rather the brain is rapidly shifting between tasks. Each of these task shifts has costs, both in time and performance, and frequent and extensive multitasking has been linked with significantly worse cognitive performance, particularly on tasks that require sustained attention.

In other words, it is generally more efficient and effective to focus deeply on one activity at a time, instead of multitasking. Some educators are concerned that the tendency of teenagers to multitask may be promoting "mile wide, inch deep" thinking and preventing the development of the patience and persistence needed for in-depth learning.

impacts brain function and behaviour, in both positive and negative ways. That paper – published in June 2020 in *Dialogues in Clinical Neuroscience* – noted the following potential harmful effects of extensive screen time and technology use:

» REDUCED ATTENTION.

Many studies have found a link between extensive screen time and attention problems, including symptoms of attention-deficit/hyperactivity disorder (ADHD). While the reasons behind this association remain unclear, researchers suggest that it might be due to the repetitive attentional shifts that commonly happen when using digital technology (i.e., multitasking), which has been shown to impair executive functioning. Also, excessive use of technology does not allow one's brain to rest, as it does during offline activities, which might also play a role in attention problems.

» IMPAIRED EMOTIONAL & SOCIAL INTELLIGENCE.

Time spent interacting with screened devices is time not spent communicating face-to-face. This is of particular concern for children and youth, who are at a critical stage of development, where face-to-face communication is key to learning how to recognize nonverbal emotional and social cues.

One research study has shown that playing violent video games interfered with the young participants' ability to recognize emotions conveyed through facial expressions. Another study found that children who spent five days without any screen-based media and digital communication tools were significantly better at recognizing nonverbal cues, compared to children who continued their usual daily screen time during the experiment.

» INTERNET ADDICTION.

The vast majority of youth and adults go online every day, with many of them reporting being online almost constantly. Some of these frequent users develop an Internet addiction, where their use is excessive and pathological.

One study estimated that the global prevalence of Internet addiction is approximately 6%, while other research suggests that number might be much higher (up to approximately 38%), depending on age and geographic location.

Internet addiction is a serious problem that shares features with other addictions such as drug/alcohol or gambling, including preoccupations, mood changes, a need for more to get the same response (i.e., tolerance), withdrawal, and functional impairment (i.e., interference with daily activities).

» SOCIAL ISOLATION.

It may seem counterintuitive, but some studies have found that social media use is linked with social isolation, with heavier users being more likely to feel like they do not have enough, good quality relationships compared to light users. (Social isolation has been associated with poor health outcomes and increased mortality.)

» IMPAIRED COGNITIVE & BRAIN DEVELOPMENT.

Various studies have found increased screen time to be associated with poorer language development and executive function, as well as behavioural problems in infants and children. One study of children between the ages of eight and twelve found changes in brain connectivity that were associated with more screen and less reading time – specifically, decreased connectivity between regions important for word recognition, and language and cognitive control.

INCREASED SCREEN TIME HAS ALSO BEEN ASSOCIATED WITH DECREASED INTEGRITY OF WHITE-MATTER PATHWAYS IN THE BRAIN THAT ARE ESSENTIAL FOR READING AND LANGUAGE. ⟶

Sleep is one of the "six pillars of brain health." Poor sleep can reduce functional connectivity and gray-matter volume in the brain, and has been associated with increased risk of cognitive impairment and Alzheimer's disease.

» DISRUPTED SLEEP.

Research has shown that screen exposure negatively impacts sleep for people of all ages. Among infants and toddlers, daily use of touch-screen devices has been shown to affect sleep onset and duration, as well as nighttime awakenings. Higher levels of smartphone and tablet use by teenagers has been associated with poor sleep quality and more sleep disturbances throughout the night. Additionally, increased smartphone use has been linked with shorter sleep duration and less efficient sleep among adults.

Why does screen use impact sleep? In part, exposure to screens disrupts sleep because of the light that these devices emit, which has been shown to affect melatonin levels and interfere with the circadian rhythms that govern sleep.

Another possible reason is the content itself – what you are viewing on a screened device may determine if/how it affects your sleep (e.g., if the content is upsetting, agitating, sad, and/or frustrating).

"Research on the consequences of digital technology on brain health is still relatively new and there is much more to learn, in part because the technologies themselves are a fairly recent feature in our lives and are ever evolving. Findings to date indicate that digital technology can both help and harm brain function," said Dr. Small, Chair of Psychiatry at Hackensack University Medical Center and Behavioral Health Physician in Chief for Hackensack Meridian Health.

> ***Some programs, video games, and other online tools may provide mental stimulation that helps to activate brain circuitry, improve cognitive function, reduce anxiety, and increase restful sleep.***

"However, excessive use of many types of digital technology appears to contribute to a host of negative consequences that everyone should be concerned about, especially parents and educators."

"The key is for each person to use digital technology in a balanced way, taking advantage of the tools that help, while keeping time spent online to a reasonable amount that allows you to maintain a vibrant offline life – with the exception being children, whose brains are in a critical period of development so they should not be engaging with screen devices at all when very young," continued Dr. Small.

WHO'S AT RISK OF INTERNET ADDICTION?

The Internet provides access to many potentially addictive activities, including gaming, gambling, social media use, shopping, pornography viewing, and simple information-seeking.

Most of us have experienced getting drawn into an online activity (or two or three) and spending much more time online than we planned. For some individuals, though, using the Internet becomes an addiction that consumes vast amounts of time, and negatively impacts relationships, school or work performance, and more.

Internet addiction affects all kinds of people, including women and men in equal numbers, and does not just affect young people. Retirees of both sexes, as well as newly separated or divorced mature women, are high-risk groups, too, as are people in life transition or individuals who feel disenfranchised.

OTHER NEGATIVE IMPACTS OF DIGITAL TECHNOLOGY

Excessive use of digital media by children and teenagers has also been strongly correlated with learning disabilities, emotional dysregulation, and behavioural disorders. In adults, it has been highly associated with anxiety, depression, sexual dysfunction and deviation, marital conflict, compromised work performance, and more.

IT APPEARS THAT EXCESSIVE DIGITAL TECHNOLOGY USE OF MANY KINDS CAN HAVE NEGATIVE EFFECTS ON PSYCHOLOGICAL HEALTH.

For example, extensive evidence exists documenting links between depression and excessive use of various forms of digital technology, including texting, watching video clips, gaming, chatting, e-mailing, and more.

In her book *iMinds: How and Why Constant Connectivity is Rewiring Our Brains and What to Do About It*, Dr. Mari Swingle notes that digital technology is rarely perceived as a potential contributor to (or cause of) these conditions, challenges, and conflicts. Many people do not realize that their frequent use of digital technology may underlie all sorts of problems beyond "texting thumb."

She describes how constantly being "plugged in" and accessible tends to speed up our brains, but not in a good way. Rather, our brains get overstimulated, and we end up living in a state

of heightened arousal much of the time, which can result in higher anxiety. Many frequent users of digital technology are agitated when they are not externally stimulated or entertained in some way, and have difficulty relaxing, feeling satisfied, and/or experiencing restorative sleep.

NOMOPHOBIA: AN EMERGING THREAT

How do you feel when:

- you do not have access to your smartphone (e.g., when taking an exam, or when you lost or forgot it somewhere);
- you notice that your smartphone's battery is low and you do not have access to a charger; or
- you have your smartphone and it is fully charged, but cellular/Internet service is down?

For many people, these situations are very stressful, and can even be anxiety-provoking.

The introduction of smartphones made it possible to access content 24/7, so it is not surprising that this ease of access has led to increased digital technology use.

MANY PEOPLE HAVE DEVELOPED AN ADDICTIVE-LIKE DEPENDENCE ON THEIR SMARTPHONES.

The term "nomophobia" (short for "no mobile phone phobia") was coined in 2008 to describe the worry or fear people experience when unable to use their smartphones. Nomophobic individuals check their smartphone often, may never turn it off (perhaps keeping it nearby during sleep), and may carry an extra charger. Nomophobia can be experienced in varying grades of severity. Some of the factors that drive nomophobia include boredom, loneliness, and insecurity.

Dr. Venetia Notara and colleagues conducted a systematic review examining nomophobia in young adults, with a focus on those between the ages of 18 and 25 years. In the 40 studies they analyzed in detail, the rates of nomophobia observed ranged from 15.2% to as high as 99.7%.

These studies found that excessive smartphone use was associated with increased psychological, emotional, social, and physical side effects – including social withdrawal, anxiety, impaired sleep, and poor academic performance. The researchers concluded that excessive use of smartphones is an emerging threat and warned that it is "evolving into an epidemic of great concern" for the field of public health that will require multifaceted interventions to address. (These findings were shared in the April 2021 issue of *Addict Health*.)

SOCIAL MEDIA'S INFLUENCE ON MENTAL HEALTH

One activity that can contribute to excessive use of digital technology is social media, and it has been a focus of much attention for its impact on mental health. Although some studies have reported positive effects or no effects, there is much research that points to negative impacts of social media on mental health, especially for teenage girls.

Some evidence indicates that compared to light users, frequent users of social media are more likely to feel socially isolated, as well as experience depression and anxiety.

A recent study conducted by Dr. Jean M. Twenge and colleagues – published in the April 2022 issue of *Acta Psychologica* – reanalyzed data from previous research and discovered that when social media was examined in isolation, rather than considered as part of the broader category of overall "screen time," the links with depression were greater. The association was even larger still when they looked specifically at the impact on teenage girls.

HIGH LEVELS OF SOCIAL MEDIA USE MAY BE HARMING GIRLS' MENTAL HEALTH MORE THAN THEIR MALE COUNTERPARTS BECAUSE GIRLS TEND TO USE SOCIAL MEDIA MUCH MORE THAN BOYS (WHO TEND TO DO MORE ONLINE GAMING).

Additionally, girls' social life and status tend to revolve around intimacy and inclusion/exclusion more than for boys, which could be making the girls more vulnerable to the "fear of missing out."

SCREEN TIME FOR CHILDREN

The Canadian Pediatric Society recommends:

- No screen time for children under the age of two;
- Less than one hour/day for children between the ages of two and five; and
- Less than two hours/day for children over the age of five.

Yet, many children spend much more time in front of screens than is recommended, and the average amount of time has been increasing over the past two decades. Of particular concern is that the age of first exposure is decreasing; younger and younger children (including infants) are being given access to digital devices, which are displacing other critical activities like social interaction, physical play, and reading.

Looking to social media for feedback and/or validation (e.g., focusing on how many "likes" and comments a post receives) can harm a young person's self-esteem, especially among those with low social-emotional well-being in the first place. Another blow to self-esteem can come from comparing oneself to others on social media, where people tend to always put their best foot forward, perhaps appearing more beautiful, successful, or "perfect" than they might otherwise appear in real life (in some cases, thanks to extensive editing of photographs).

When scrolling through endless posts in highly curated feeds of people you know (or influencers/celebrities you do not know), it is easy to think that everyone else looks better than you, has more/nicer things than you, and are leading lives that are more exciting and vibrant than yours.

Then, the hyper-personalized advertising on these social media platforms further emphasizes the "problems" you have, and the many products and services available that you can purchase to "fix" everything – for example, makeup to contour/highlight your face, skin care to reduce acne or wrinkles, and programs to help you lose weight or make money online. It is a perfect recipe for undermining self-confidence.

HOW MUCH ITECH USE IS TOO MUCH?

For most people, a certain amount of screen time is necessary and cannot be avoided (e.g., for school and work), and many people want to use screened devices in their leisure time for entertainment and/or learning purposes. Not all screen time is bad for you, though.

More research is needed to better understand the underlying mechanisms and to determine causal relationships between variables, including how the impacts may vary by age group and sex. This is likely to require additional research since the association between high levels of social media use and worse mental health is complex, involving interactions between many variables.

For example, it may be social media's impact on sleep, sedentary behaviour, and reduced in-person social interaction that then evolves into poor mental health. Nevertheless, the evidence to date is certainly strong enough to recommend taking action to limit screen time to a reasonable amount, especially for children and adolescents.

What is a reasonable amount, though? For infants and young children, little to no screen time is recommended, but beyond that, there is not a one-size-fits-all answer for the ideal time limit for iTech usage. Digital technologies affect each person differently, depending on a number of factors such as why and how the technology is being used, and how susceptible an individual is to develop an addiction (which varies immensely depending on variables like age, gender, ethnicity, personality, and genetics).

Watch for these early warning signs that could indicate you or your child/teenager is spending too much time on screened devices, and could have (or be developing) an Internet addiction:

- signs of depression such as negativity, apathy, or withdrawal; or
- signs of anxiety such as edginess, sleeplessness, or moodiness.

Moderation and mindfulness are key. Pay attention to how your digital technology use makes you feel, both physically and emotionally. If you must use digital technology for long periods, remember to take frequent breaks to get up and move around or to stretch. That will give your brain a rest while also importantly breaking up sedentary time.

If you find yourself continuing to spend more time than you would like online, then you might want to consider using a mobile application that can help by limiting what you are able to access during set periods of time (perhaps cutting off Internet access or social media access during set work or study times), and/or a tool that tracks your screen time to help you be more aware of usage. There are also settings on various devices that you can use to help you maintain focus and limit screen time (e.g., "do not disturb" features that turn off notifications).

WHAT TO DO INSTEAD?

If you are going to start decreasing the time you spend using digital technology, then you will need to figure out what you will do instead. What offline activities will you do to replace your usual online time?

Consider reintroducing things that digital technology replaced in your life (or perhaps, in the case of children/teenagers in your life, introduce them to new things that they have not experienced yet because they have been so busy on their devices). Put your smartphone and tablet down, step away from the computer and television, and reengage in the offline world more. Go for nature walks, learn a new skill, host fun dinner parties, take in-person dancing lessons, play boardgames, go to in-person yoga and meditation classes, experiment with new recipes, read aloud to the children in your life (and read books for pleasure yourself), plant and tend a garden, volunteer, and/or perhaps simply take a quick nap.

There are an endless number of activities that you can do offline that are enjoyable and support your brain health. (All of the examples just listed are activities that fall within the "Six Pillars of Brain Health.")

On the Edge

STRESS, DEPRESSION, & INFLAMMATION'S IMPACT ON THE BRAIN

Whether it is family tensions, trouble at work, or a constant barrage of negative news, stress is an unavoidable fact of life. For a long time, stress was believed to be something experienced only in our brain. More recently, however, researchers have begun taking a broader, full body view of stress and its impacts on our health.

"It's logical because when you're stressed, your heart is pumping, your breathing accelerates, and you'll have a knot in your gut. These are the phenomena people experience but we don't exactly know if and how they may contribute to the actual brain response, especially if the stressor is lasting for a long period," said Dr. Caroline Ménard, an Assistant Professor in the Department of Psychiatry and Neuroscience at the Université Laval and a researcher at the CERVO Brain Research Centre.

"Of course, the brain is the master regulator, but we think that there might be a contribution from other parts of the body such as the immune system or the gut microbiota. That's what we're trying to understand."

Dr. Ménard and her colleagues are currently studying how and why stress might contribute to mood disorders such as depression or posttraumatic stress disorder (PTSD).

"I think it's an exciting and essential field of research," Dr. Ménard told Mind Over Matter®.

> **STRESS TOUCHES EVERYBODY, AS WE'VE SEEN IN THE PAST TWO YEARS. IN MY LAB, WE'RE TRYING TO UNDERSTAND BOTH SIDES OF THE COIN: NOT ONLY HOW STRESS CAN LEAD TO DEPRESSION, BUT ALSO WHY SOME PEOPLE ARE MORE RESILIENT THAN OTHERS.** ⟶

VULNERABILITY VS. RESILIENCE

Supported by a 2019 Azrieli Future Leader in Canadian Brain Research grant from Brain Canada, and made possible through the Canada Brain Research Fund (CBRF), Brain Canada's partnership with the Government of Canada, Dr. Ménard's research team is looking for answers by observing how mice react to various forms of stress. Importantly, the researchers also confirm (when possible) whether the biological mechanisms identified in mouse models of depression are also present in human samples.

Her focus is on the blood-brain barrier (BBB), a network of cells that forms a physical barrier that helps prevent harmful substances circulating in the blood from reaching the brain, and the gut barrier, which performs a similar function in our intestines.

Through their studies of mice, Dr. Ménard and her team found that during long periods of persistent stress, inflammation could make the BBB more fragile, thereby allowing the passage of deleterious cytokines from the blood into the brain, which could contribute to depression. This finding was subsequently verified in the brains of deceased individuals who had received a diagnosis of major depression.

THE RESEARCHERS ALSO LOOKED FOR VARIANCES BETWEEN WOMEN'S AND MEN'S BRAINS AND FOUND THAT THE BLOOD-BRAIN BARRIER WAS AFFECTED IN DIFFERENT REGIONS, SOMETHING THAT MIGHT EXPLAIN WHY WOMEN AND MEN SOMETIMES EXHIBIT DIFFERENT SYMPTOMS OF DEPRESSION.

While symptoms will vary from person to person, research has indicated that women are more likely to display more "classic" symptoms of depression, such as crying, whereas men may become more irritable.

Sex differences were also found in the way that the mice reacted to stress. For example, males were more affected by simulations of ongoing bullying, whereas the females were more affected by unpredictable stressors such as a delay in receiving food or water.

SEARCHING FOR BETTER TREATMENTS

"We're really trying to understand the role that these barriers (both the BBB and the gut barrier) play in stress responses, and if they could represent attractive targets to develop novel antidepressants or support the treatments currently available," noted Dr. Ménard.

Between 30-50% of people with major depressive disorder are resistant to current antidepression treatments.

When we are stressed, our body's immune system releases inflammatory cells and signals such as proinflammatory cytokines.

IT'S VERY INTRIGUING BECAUSE IN PEOPLE WHO ARE RESISTANT TO ANTIDEPRESSANT TREATMENT, WE SEE THIS INCREASE IN INFLAMMATION IN THE BLOOD, AND WE THINK THAT IT MIGHT COME FROM THE GUT AND POSSIBLY PLAY AN ACTIVE ROLE IN TREATMENT RESISTANCE.

In the last decade there has been increasing interest in the bacteria of our gut and the microbiome and how they can regulate human health, including emotional processes. If the gut barrier becomes leaky due to persistent stress (as Dr. Ménard's team observed for the BBB), then this may ultimately play a role in making the BBB leaky as well and contribute to the inflammation reaching the brain.

"This is something we're trying to figure out. Basically, stress is not only in the brain, but also your whole body, including the gut."

An important aspect of her work is studying why certain individuals are more resilient (i.e., why does one person become depressed after experiencing stress, while another does not). Is it possible to train our brain and body to be resilient? Dr. Ménard suggests that the answers may lie, at least in part, in improving the BBB and the gut barrier to better protect the brain from the effects of inflammation.

"It seems that we can promote resilience. It could be done with diet for the gut and for the BBB, and we know that exercise can improve neurovascular health. That's the kind of thing we're trying to tackle by giving running wheels or a diet enriched in good fatty acids to our mice before (as opposed to during) exposure to stress. We hope to understand the biology of resilience and how diet or exercising contribute to positive mental health. In humans it is very challenging to do because people will often decide to eat better and exercise more at the same time."

In the process, she hopes to discover better ways of diagnosing, treating, and perhaps even preventing depression. Currently, it is challenging for physicians to determine which medication will work best in treating depression for an individual because symptoms and life experiences vary, and the effectiveness of

Elevated inflammation, including in the brain, is found in people with a variety of other conditions such as Alzheimer's disease, stroke, and cardiovascular diseases. Clinical studies suggest that individuals with these conditions have higher rates of depression and, conversely, those with depression are more at risk of developing these conditions. It suggests that stress – through its impact not only on the brain, but also on the immune system and the gut barrier – may play a role in higher prevalence of depression in these individuals. However, future studies are required to better understand these relationships.

treatments varies between the sexes. For example, some clinical studies suggest that women respond better to selective serotonin reuptake inhibitors (SSRIs), while men seem to respond better to tricyclic antidepressants.

IMPROVING DIAGNOSIS

Unlike other diseases, like cancer, psychiatric conditions do not have biological markers yet. There is no genetic test or a particular molecule that can be measured in the blood to confirm diagnosis. Consequently, clinicians must rely primarily on questionnaires. When asked to measure emotional distress on a scale between one and ten, different people will give different answers that may not accurately reflect their level of distress.

Dr. Ménard believes that having an unbiased biomarker would be a significant advancement.

"We work hard to find biomarkers that will help guide the choice of treatment or maybe even identify targets that will lead to the development of new treatments that could target systems other than the brain, like the gut and inflammation – treatments that could complement those that we already have and help more people than we do right now," she said.

"We really call it the holy grail in psychiatry."

Looking ahead, she aspires to secure funding to expand her studies into the impacts of stress and inflammation on dementia.

Dr. Ménard's work has potentially profound implications and she credits Brain Canada's support as crucial, particularly given that she is early in her career as a scientist – a time when grants are harder to obtain.

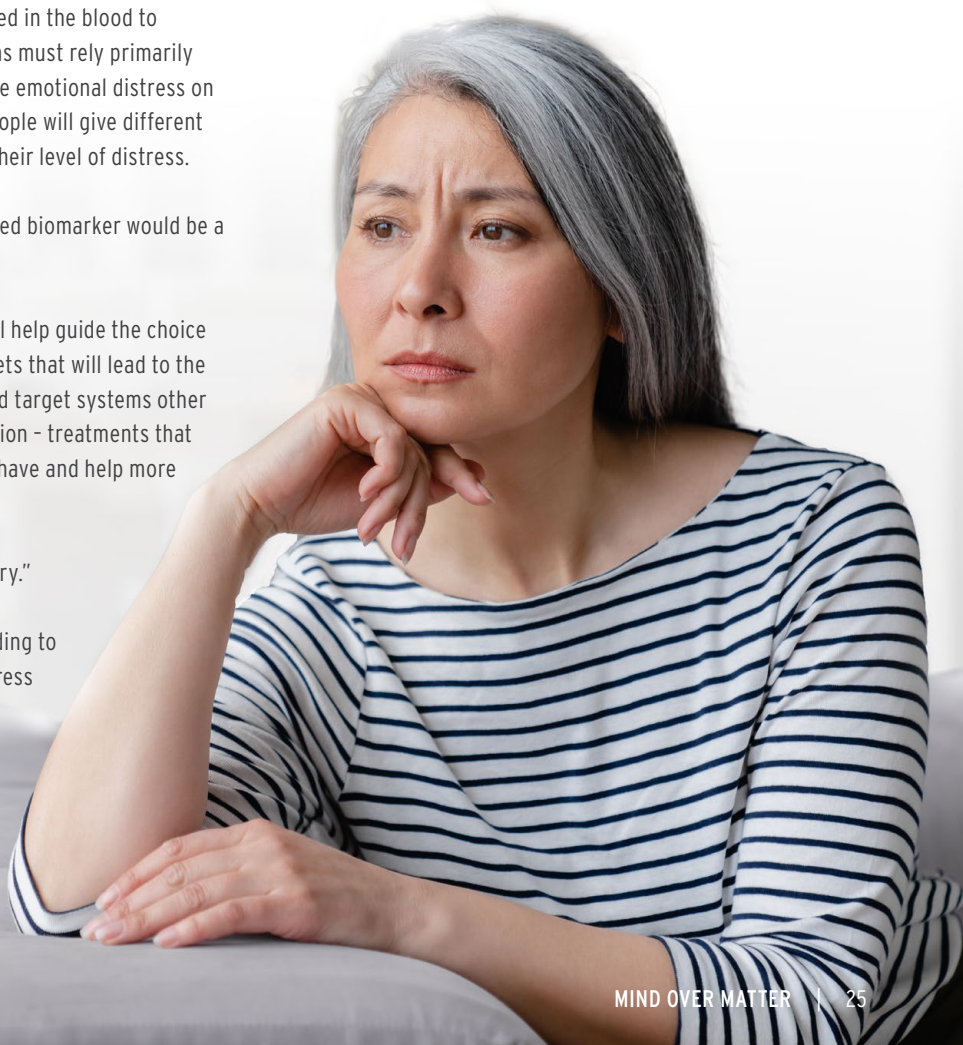
"The Brain Canada funding is very important because it allows us to open a new line of research and supports the training of the next generation of scientists. We're very grateful for the support. We couldn't do this without them."

She noted that she is constantly asked for advice about how to minimize stress and promote resilience.

"There's no one recipe; everyone must figure out their own – baking, gardening, listening to or playing music, spending time with family, and/or sometimes just taking a few minutes out of your day to relax can make a difference. But if you do feel badly, then you should not hesitate to seek professional help."

When asked for her personal recipe, Dr. Ménard laughed as she discussed her love of video games and live concerts.

"It's very good to get out of my head and not think about the science."



DEMENTIA MYTH-BUSTING

There are many misconceptions about dementia. One of the most common is a myth that dementia is inevitable with age. "Dementia is not a normal part of aging," explained Colleen Hill, an Executive Director with the Alzheimer Society of Ontario. "Many people live into old age with vibrant cognitive function intact."

Another common misconception is that there is no way to influence one's risk of developing dementia. In a 2018 poll by Alzheimer's Research U.K., only 34% of respondents thought that dementia was a condition that they could reduce their risk of developing, compared to 81% for diabetes, 77% for heart disease, 60% for stroke, and 52% for cancer.

Yet, just as with those other conditions, there are actions that you can proactively take to reduce dementia risk. "Making healthy lifestyle choices can even help offset genetic predisposition to dementia, possibly delaying or preventing dementia entirely," said Hill.

Do you know your SIX PILLARS *of* BRAIN HEALTH?

REDUCE DEMENTIA RISK THROUGH YOUR LIFESTYLE CHOICES

Dementia risk is affected by many factors, some of which we have no control over such as genetics and age. However, research shows that there are several things that we can do (or not do) to help support our brain health as we age and decrease the risk of developing dementia.

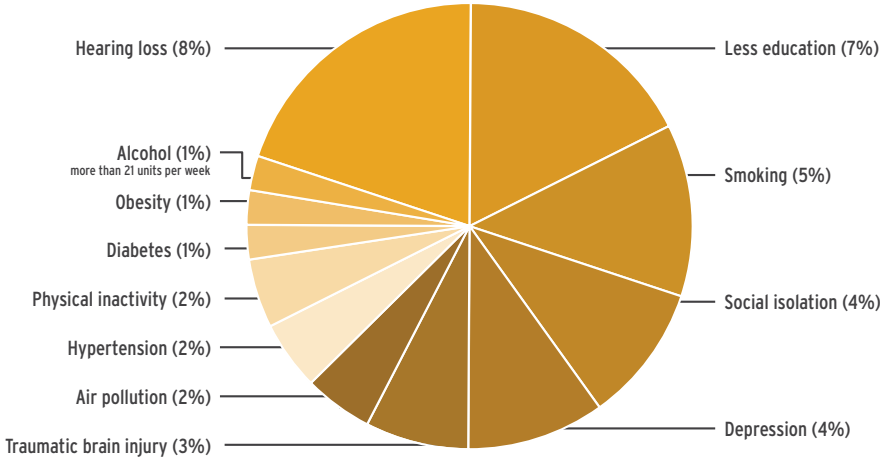
When it comes to research about dementia prevention, one paper that is often referenced is "Dementia prevention, intervention, and care: 2020 report of the Lancet Commission," which was written by more than 25 researchers from around the world.

Based on their extensive review of the current evidence, the researchers suggest that there are 12 modifiable risk factors that collectively account for approximately 40% of worldwide dementias.

In other words, if those 12 modifiable risk factors were eliminated, then 40% of the cases of dementia globally could theoretically be prevented or delayed. Those risk factors are outlined below (along with the estimated percentage reduction in dementia prevalence if each risk factor was eliminated independently).

Although these figures are estimates only and further study is needed, the overall message from this research sends an important signal: a sizeable amount of dementia cases may be prevented or delayed through our own actions or behaviours. →

DEMENTIA RISK FACTORS



Many such actions are related to lifestyle choices. Some are choices to not do something (e.g., smoke or drink excess amounts of alcohol), while others are choices to do something (e.g., exercise).

"For more than a decade, Women's Brain Health Initiative has been working to spread the word about all of the positive choices that individuals can make to help keep their brains healthy as they age and decrease the risk of developing dementia," said Lynn Posluns, President and CEO of Women's Brain Health Initiative. "We refer to these choices as the 'six pillars of brain health.'"

lifestyle factors considered were: (1) non-smoking; (2) 150 minutes or more per week of moderate to vigorous physical activity; (3) light to moderate alcohol consumption; (4) high-quality diet; and (5) engagement in late-life cognitive activities.

NOT ALL CASES OF DEMENTIA ARE PREVENTABLE

While we want to empower people with the knowledge that there are actions one can take to decrease dementia risk, it is equally important to educate people that not all cases of dementia are preventable.

THE SIX PILLARS OF BRAIN HEALTH

- Exercise
- Mental Stimulation
- Social Activity
- Nutrition
- Stress Management
- Sleep

In this article, we summarize some of the latest research behind why each of these six pillars are so important individually for dementia risk reduction, as well as the synergies when they are combined.

"The more people who know about the importance of eating well, getting regular exercise and enough sleep, connecting with others, engaging in cognitively challenging activities, and managing stress for optimal brain health, the better," said Posluns. "If even a small number of cases of dementia are prevented or delayed, the positive impact on individuals, families, and society will be immeasurable."

TAKE ACTION IN ALL SIX PILLARS TO MAXIMIZE IMPACT

Research aligns with what logic might imply: the greater the number of healthy lifestyle behaviours a person engages in, the lower the risk of developing dementia.

For example, a study conducted by Dr. Klodian Dhana and colleagues (published in 2020 in *Neurology*) found that participants who engaged in two to three healthy lifestyle factors had a 37% lower risk of Alzheimer's disease (AD), compared to participants who did not engage in any healthy lifestyle factors or only one healthy lifestyle factor.

For the participants who engaged in four to five healthy lifestyle factors, the risk was even lower (60%). In this study, the five

There are so many variables (not all of which are even understood at this point) that may influence whether a given individual develops dementia or not. Even if someone follows the recommendations for all six pillars of brain health and addresses all other known modifiable risk factors, there is still the possibility of developing dementia.

We mention this not to put a damper on enthusiasm about lifestyle change, but rather to mitigate any potential stigma. We do not want to leave anyone with the impression that if someone develops dementia, it is somehow her or his "fault" because she or he could have made different choices to prevent it.

Another important factor to note is that motivation and willpower are only part of what influence lifestyle choices; there are environmental, cultural, and other influences that can make it difficult for some people to make healthy lifestyle choices (e.g., not everyone has readily available and affordable nutritious food).

"There's already so much stigma about having dementia, it's really important that when we talk about lifestyle strategies to decrease dementia risk that we emphasize we are only talking about risk reduction, not risk elimination," emphasized Colleen Hill, an Executive Director with the Alzheimer Society of Ontario. "There isn't a way to guarantee that an individual won't get dementia, even if they do everything that is currently known to help prevent it."

Exercise

Most people are aware that exercise is good for your physical health and well-being. The importance of exercise for cardiovascular health, for example, has been widely understood and communicated for years. However, many people do not realize that exercise benefits your brain health as well.

Large observational studies with lengthy follow-up periods have found that individuals who lead physically active lives are less likely to experience cognitive decline or develop dementia compared to those who are inactive.

A large meta-analysis – conducted by Dr. Francesco Sofi and colleagues and published in 2011 in *Journal of Internal Medicine* – found that participants with high levels of physical activity showed a 38% reduction in the risk of cognitive decline, compared with sedentary participants. Even the participants who engaged in low to moderate levels of physical activity experienced a significant risk reduction (35%). Interestingly, the findings also suggested that the effect of physical activity on cognitive function may be stronger in women than in men.

An even larger meta-analysis – conducted by Dr. Mark Hamer and Dr. Yoichi Chida – found that physical activity was associated with a 45% reduction in the risk of developing AD. These findings were published in 2008 in *Psychological Medicine*.

Why does physical activity benefit brain health? Research has found that exercise:

- Improves blood flow to the brain, thereby boosting the supply of oxygen and nutrients;
- Stimulates increased levels of crucial brain compounds such as brain-derived neurotropic factor (decreased levels of brain-derived neurotropic factor are linked with neurodegenerative diseases involving neuronal loss, such as AD, Parkinson's disease, and multiple sclerosis);
- Boosts neurogenesis and neuroplasticity (i.e., helps build new brain cells and form/reorganize connections between cells);
- Alters the activity of microglia (the brain's immune cells) in a way that lowers inflammation in the brain (inflammation in the brain can impair cognitive function and is a risk factor for AD); and
- Helps reduce dementia risk indirectly by improving sleep, relieving stress (thereby reducing cortisol levels), lowering blood pressure and cholesterol levels, and reducing risk of cardiovascular disease, diabetes, depression, and anxiety.

What type of physical activity is best, and how much activity is enough? Research has not definitively answered these questions yet and more research is needed to determine optimal exercise "prescriptions" to maximize brain benefits.

The latest Canadian Physical Activity Guidelines for adults aged 18 and over (for overall health, not just brain health) recommend a total of 2.5 hours of moderate to vigorous aerobic activity each week, in sessions of ten minutes or more, as well as one or more strength-building activities at least twice a week. In addition, adults aged 65 and over are advised to engage in physical activity that challenges balance.

EVIDENCE CONTINUES TO GROW SHOWING THAT PHYSICAL MOVEMENT (IN PRACTICALLY ANY FORM) BENEFITS THE BRAIN.

Whether it is aerobic exercise or strength training, performed in long or short sessions (and at varying intensity), physical movement supports healthy brain function to some degree.

Formal exercise sessions are not the only physical activity that count, either; being less sedentary in your day-to-day life helps support brain health as well – whether you are walking and cycling for your errands, gardening, cleaning your home, or playing actively with children or pets.

"Physical activity doesn't just help provide protection for cognitively healthy people; rather, it can also have a positive impact on cognitive function and well-being in people who already have neurodegenerative diseases," said Hill.

"Further, physical activity can benefit the brain regardless of age or existing fitness level. So, even if a person cannot meet the Canadian Physical Activity Guidelines, because of illness or disability for example, I encourage them to do what they can. Perhaps it's just stretching in bed or walking around the room or down the hall with a walker. Every bit of movement appears to help support brain health." →

Mental Stimulation

When it comes to keeping your brain healthy, exercising your mind is as important as exercising your body. Engaging in cognitively stimulating activities throughout one's life is associated with a lower risk of developing dementia.

There is strong evidence linking higher educational levels with lower dementia risk. (You will recall that "less education" was the second-strongest modifiable risk factor listed in the Lancet Commission's paper, accounting for approximately 7% of dementia case reduction if eliminated.)

IT APPEARS THAT HIGHER LEVELS OF EDUCATION STIMULATE THE BRAIN TO BUILD "COGNITIVE RESERVE."

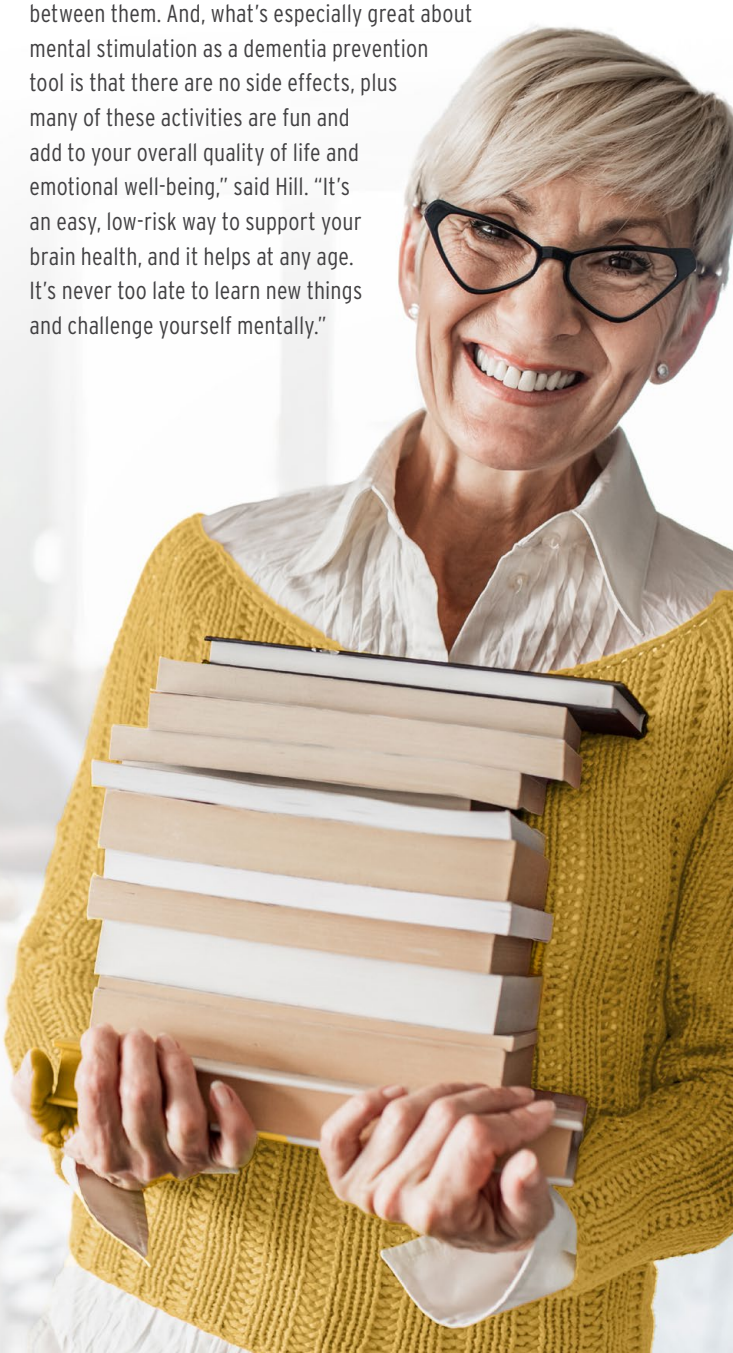
The brains of individuals with high cognitive reserve continue to have normal cognitive function even when their brains develop dementia-type physical damage; their brains are resilient, forming new connections between neurons to rewire around damaged ones.

These resilient individuals are surprisingly not rare. It is estimated that approximately 30% of older adults have enough amyloid-beta and/or tau in their brains to qualify for a diagnosis of AD, yet they do not exhibit any outward symptoms.

Education is not the only way to build cognitive reserve. Other ways include having a more mentally demanding occupation, speaking more than one language, and engaging in mentally stimulating leisure activities such as playing a musical instrument, reading, and solving puzzles.

The key to reaping maximum brain benefits is to choose activities that are mentally challenging – in other words, activities that provide novelty, variety, a high level of engagement, and go beyond what is easy or comfortable for you. The more challenging the task, the higher the positive impact.

"Challenging your brain with novel activities and new ways of doing things helps to build new brain cells and strengthen connections between them. And, what's especially great about mental stimulation as a dementia prevention tool is that there are no side effects, plus many of these activities are fun and add to your overall quality of life and emotional well-being," said Hill. "It's an easy, low-risk way to support your brain health, and it helps at any age. It's never too late to learn new things and challenge yourself mentally."



MULTI-PILLAR ACTIVITIES

Some activities naturally fall into multiple pillars, potentially providing more impact for your efforts. Examples of such synergistic activities include:

- Dancing, which provides exercise, mental stimulation (if you are learning new dance routines), social connection (if you are dancing with others), stress management (because all forms of exercise help with stress), and may help you sleep better;
- Hosting a dinner party, which provides social connection, mental stimulation (if you plan a new menu or get creative with a theme and/or decorations), nutrition (as long as you choose to serve some healthy foods), and some exercise (i.e., all that standing in the kitchen doing food preparation breaks up sedentary time); and
- Hiking with a group, which provides exercise, stress relief (from the exercise and being outdoors), social connection, and may help you sleep better (from all that movement and fresh air).

Social Activity

Social isolation has been linked with an increased risk of cognitive impairment and dementia, while high social contact (measured by one's social activity levels and/or the size of one's social network) has been associated with better late-life cognitive function.

SOCIAL ENGAGEMENT IS A PREDICTOR OF OVERALL WELL-BEING THROUGHOUT LIFE.

Why is social activity important for brain health? Researchers do not know for certain all of the ways in which social engagement supports brain health, but some of the proposed explanations for the positive effect include:

- Social contact helps to build cognitive reserve (perhaps through intellectual stimulation from interacting with others);
- Social engagement improves the immune system;
- Positive social interactions and support can help reduce chronic stress (stress management is one of the other six pillars of brain health); and
- People with strong social engagement are known to be much less vulnerable to some dementia risk factors, including smoking, alcohol misuse, depression, and obesity.

Social activity can be broadly defined and does not just mean socializing formally with friends and/or family. Rather, it can include any positive interactions that you have with others, including with neighbours, colleagues, and/or customers at work or while volunteering, and members of your church or political organization. Even interaction with animals can help alleviate feelings of loneliness.

HEARING LOSS & DEMENTIA RISK

Several studies have found a link between hearing loss and dementia risk, including the Lancet Commission's 2020 report regarding dementia prevention, intervention, and care, in which the researchers estimated that approximately 8% of worldwide dementia cases could be prevented or delayed if hearing loss was eliminated as a risk factor (making hearing loss the modifiable risk factor with the highest impact among the 12 factors listed).

One of the reasons hearing loss is thought to be associated with dementia risk is the negative impact that it has on social engagement. It is harder to stay connected to others when one experiences partial or complete hearing loss.

"Social connection is one of the pillars of brain health that we focus on a lot at the Alzheimer Society of Ontario because of its overarching impact. When you have a vibrant, positive social life, you tend to feel less stressed, have opportunities to stretch your mind, and maybe have friends to support you in exercising more or eating healthier," said Hill.

"It's important to note that each person's version of a vibrant, desirable social life will be different. We all have unique preferences about how many relationships we want to nurture, how often we enjoy connecting with others, and what activities we engage in when we do. Everyone needs at least one person in their life that they feel close to and can confide in, though. So, take steps to build the type of social life you like best, and remember that the quality of relationships matters more than quantity." →

Nutrition

The human brain requires a constant supply of glucose, vitamins, minerals, essential fats, and amino acids in order to function. These nutrients work collectively to help support learning, memory, sleep, mood, and focus – making nutrition essential for a healthy brain.

WHEN ANY NUTRIENT IS IN SHORT SUPPLY, BRAIN FUNCTION IS NEGATIVELY AFFECTED.

What should you eat for optimal brain health? A well-researched and effective brain-healthy diet is the "MIND diet" (Mediterranean-DASH Intervention for Neurodegenerative Delay). It borrows elements from the heart-healthy Mediterranean diet and the blood pressure-lowering DASH diet (Dietary Approaches to Stop Hypertension).

While all three of these diets emphasize plant foods and a low intake of high-fat foods, the MIND diet specifically focuses on foods and nutrients that are linked with optimal brain health.

The MIND diet has been linked in multiple studies with less cognitive decline, as well as lower risk of dementia. For example, a study of adults in the United States found that high adherence to the MIND diet was associated with a 53% lower risk of AD, compared to low adherence.

Even moderate adherence was linked with a lower risk of AD (35%). That research was conducted by Dr. Martha Clare Morris and colleagues and published in September 2015 in *Alzheimer's & Dementia: The Journal of the Alzheimer's Association*.

Research on the role of individual foods or micronutrients in brain health has also been conducted. According to the World Health Organization, the individual foods that have consistently been associated with decreased risk of dementia are fruits, vegetables, and fish.

WHEN IT COMES TO FRUITS AND VEGETABLES, YOU CAN MAXIMIZE THE POSITIVE IMPACT ON YOUR BRAIN HEALTH BY "EATING THE RAINBOW."

In other words, it is important to eat a diverse range of fruits and vegetables (and/or any plant foods, including tea, legumes, nuts, whole grains, herbs, and spices) in a wide variety of colours.

Colourful plant foods are rich in phytonutrients. Diets that are low in phytonutrients have been linked with obesity, elevated cholesterol and blood pressure, insulin resistance, and prediabetes – all of which are dementia risk factors. Conversely, diets that are high in phytonutrients have been linked with better cognitive function and mental health (i.e., lower prevalence of depressive symptoms and anxiety).

"It is well-understood by most people that healthy eating can help reduce the risk of heart disease, stroke, and diabetes. Fewer people realize the impact of food on brain health, yet nutrition is critically important for the optimal function of your entire body, including your brain," noted Hill.

"It's not always easy to make changes to our eating habits, but research suggests that even moderate shifts toward eating healthier can help. So, I encourage everyone to become familiar with the MIND diet and begin following it as best as they can to enjoy a delicious journey toward improved brain health."

The MIND diet recommends eating certain foods while minimizing or avoiding others.

10 BRAIN-HEALTHY FOODS TO EMPHASIZE

- Green leafy vegetables
- Other vegetables
- Nuts
- Berries
- Beans
- Whole grains
- Fish
- Poultry
- Olive oil
- Red wine

5 UNHEALTHY FOODS TO MINIMIZE OR AVOID

- Red meats
- Butter and margarine
- Cheese
- Pastries and sweets
- Fried/fast foods

Stress Management

Stress is a normal part of everyday life. However, if that stress is severely traumatic, happens frequently, or becomes chronic, it takes a toll on your brain health and thereby increases the risk of mild cognitive impairment and dementia.

A recent meta-analysis of 16 studies – conducted by Katherine Franks and colleagues and published in 2021 in *Journal of Alzheimer's Disease* – found that higher perceived stress was associated with 1.19-times the risk of mild cognitive impairment and 1.44-times the risk of all-cause dementia.

Another meta-analysis – conducted by Mia Maria Günak and colleagues and published in 2020 in *The British Journal of Psychiatry* – looked at the link between post-traumatic stress disorder (PTSD) and dementia risk across ten studies. The researchers found that those in the general population with PTSD had 2.11-times the risk of being diagnosed with dementia, compared to those without a PTSD diagnosis.

Why does stress have a negative impact on your brain health? It is partly because stress induces hormonal and vascular changes that, when experienced for a prolonged period, result in increased blood pressure, higher blood sugar levels, and inflammation – all of which are associated with dementia risk.

CHRONIC STRESS ALSO LEADS TO BRAIN CELL DEATH, SHRINKING BRAIN REGIONS INVOLVED WITH MEMORY AND MOOD REGULATION.

Further, stress is a major contributor to insufficient sleep and sleep is critical for brain health.

"Stress is a major presence in people's lives these days. While it's important to do what you can to reduce the number of stressors you face, there's sometimes no way to avoid facing some serious amounts of stress. What's critical is that you have strategies for coping with stress in healthy ways," explained Ms. Hill.

"Meditation and mindful movement practices such as yoga, Tai Chi, and Qigong are great stress relievers. So is any other type of exercise and socializing, especially if you laugh a lot. Getting enough sleep and asking for help if you need it are also key during stressful times." →

Sleep

Not getting enough, good-quality sleep on a regular basis not only leaves you feeling tired and irritable, but also negatively impacts your brain health.

SLEEP PROBLEMS ARE ASSOCIATED WITH A HIGHER RISK OF COGNITIVE DECLINE AND DEMENTIA.

One meta-analysis of 27 studies – conducted by Dr. Omonigho Michael Bubu and colleagues and published in 2017 in *SLEEP* – found that individuals with sleep problems (including short and long sleep duration, poor sleep quality, circadian rhythm abnormality, insomnia, or obstructive sleep apnea) had a 1.55-times higher risk of AD, a 1.65-times higher risk of cognitive impairment, and a 3.78-times higher risk of preclinical AD, compared to those without sleep problems.

Even in the absence of serious sleep problems, how much sleep you get (and the quality of that sleep) affects your cognitive function, especially memory, attention, and mental health.

What makes sleep so important for brain health?

- Sleep plays an important role in learning and memory. Getting enough sleep helps with focus and attention while you are awake. Sleep itself is a time for consolidating memories (i.e., when recently learned information is transformed into long-term memory).

- Sleep helps clear away waste proteins in the brain, including beta-amyloid (which, in excess, has been linked with higher risk of AD). Just one night of sleep deprivation has been found to reduce clearance of those neurodegenerative proteins from the brain.

- Poor sleep is linked with various conditions, including depression, obesity, hypertension, and diabetes, which are each dementia risk factors.

- In cases of sleep-disrupted breathing disorders (such as obstructive sleep apnea), not only is sleep disrupted, but the brain also experiences intermittent drops in oxygenation, which contributes to brain cell death and dysfunction.

How much sleep is ideal for optimal brain function? Research suggests that there may be a "sweet spot" – i.e., a mid-range amount that is ideal, because not getting enough sleep or getting too much sleep can be detrimental.

Exactly where that "sweet spot" falls is still being determined, though. Research to date – including a recent study conducted by Xin You Tai and colleagues – points to it being somewhere between six and eight hours per night.

That study, published in 2022 in *Communications Biology*, examined the impact of sleep duration on executive function and brain structure in healthy individuals between the ages of 38 and 73 years. When it came to cognitive performance, the researchers found that seven hours of sleep per day was associated with the best performance, and for every hour below or above seven hours, cognitive performance progressively decreased.

When they looked at grey matter volume, the researchers found that individuals who slept between six and eight hours each night had significantly more volume in 46 different brain regions. (More grey matter volume is a good thing; it tends to shrink with age and as it does, cognitive function tends to decrease.)

DON'T DELAY - MAKE HEALTHY LIFESTYLE CHOICES TODAY

Dementia develops over a long period of time, with changes starting to occur in the brain decades before any symptoms appear. The earlier in life that you begin making healthy choices in all six pillars of brain health, the better.

Even though early intervention is best to prevent cognitive decline, it is never too late to make positive changes and still potentially benefit your brain health.

While the six pillars described in this article help protect brain health, they will do more than that. Our brains are just one part of an intricately connected body, so it is not surprising that when we eat nutritious foods, move our bodies regularly, challenge our minds, connect with others, relax, and get enough sleep that there are beneficial effects beyond cognitive function.

Making healthy lifestyle choices in some or all of the six pillars will also benefit your cardiovascular health and mental health, help prevent diabetes, boost your day-to-day energy and vitality, and more.

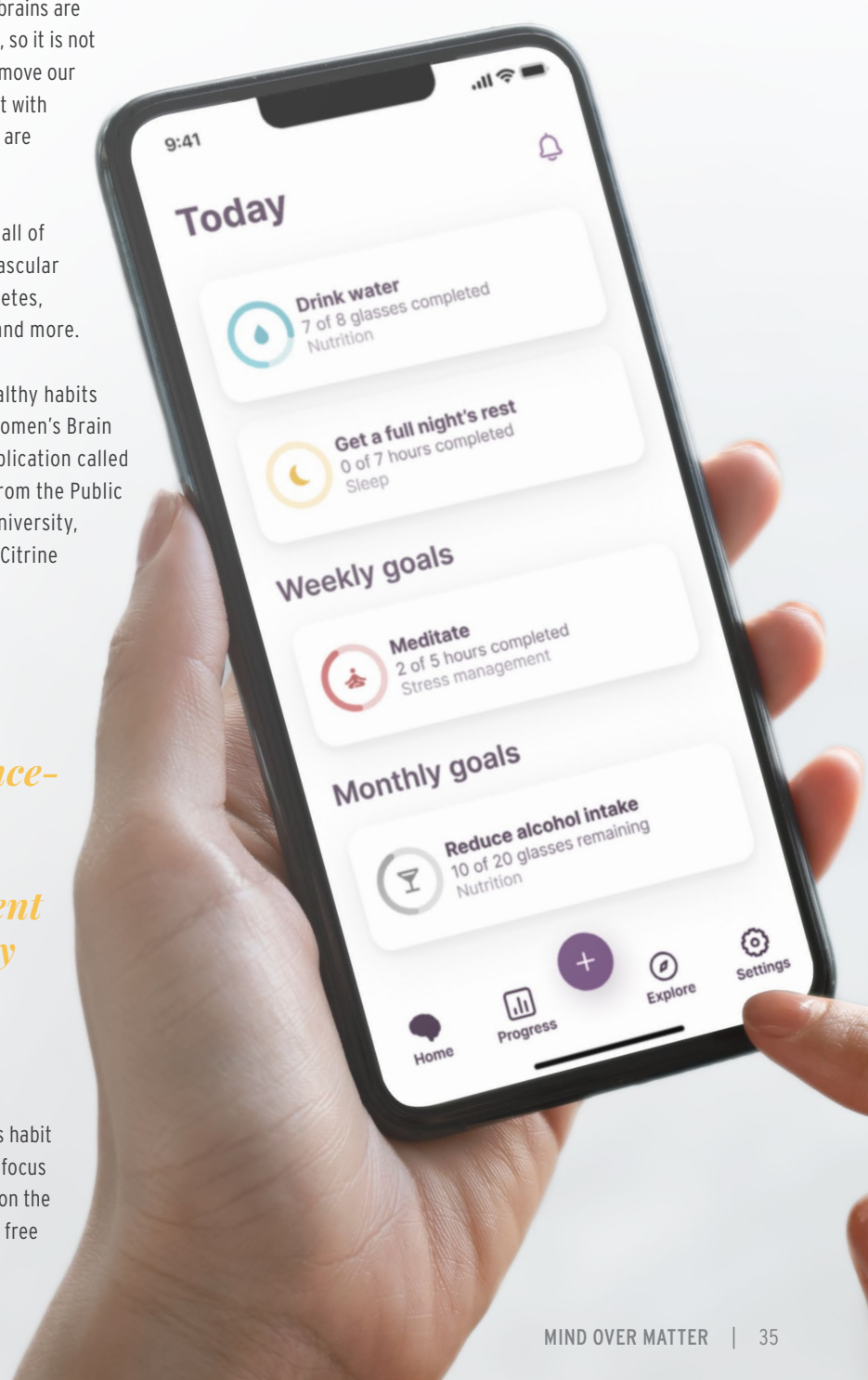
"To help adults of all ages in developing healthy habits to protect and prolong their brain health, Women's Brain Health Initiative has developed a mobile application called 'BrainFit,' thanks to the generous support from the Public Health Agency of Canada, BitBakery, York University, Telus, Royal Bank of Canada, RB33, and The Citrine Foundation of Canada," said Posluns.

> ***BrainFit offers timely and convenient evidence-based information, practical application tips, and encouragement to create brain-healthy habits to get and stay brain fit.***

This one-of-a-kind behaviour design app takes habit tracking to another level. It is the only app to focus on optimizing brain health, with an emphasis on the six pillars of brain health, and it is completely free to use. There are no hidden costs to sign up, gain access to app features, track your achievements, or see the best content.

"BrainFit is personalized and customizable. The content is curated specifically to help users protect their brain health. It leverages our vast network of experts and advisors, builds on our Mind Over Matter® magazines, and includes access to the new Mind Over Matter® podcast and video series," continued Posluns.

Available for both iPhone and Android, BrainFit - Free Habit Tracker launches this December in the app store.



Optimize Your Brain Health

NEW MOBILE APP HELPS YOU GET & STAY BRAIN FIT

As an integral component of the Mind Over Matter® campaign, Women's Brain Health Initiative (WBHI) has created a mobile application (or app) called "BrainFit" – a unique habit tracker designed to help users prolong their cognitive vitality.

BRAINFIT IS THE ONLY APP OF ITS KIND TO FOCUS ON OPTIMIZING BRAIN HEALTH, WITH AN EMPHASIS ON EACH OF THE "SIX PILLARS OF BRAIN HEALTH," AND IS COMPLETELY FREE TO USE.

As highlighted in the article "Do You Know Your Six Pillars of Brain Health?" (starting on page 26 in this edition of Mind Over Matter®), the six pillars are stress management, exercise, mental stimulation, social activity, nutrition, and sleep. Collectively, these pillars or lifestyle choices may give you the best opportunity to keep your brain functioning well.

BrainFit was created to give both women and men (including caregivers, health care professionals, service providers, and policymakers) a practical wellness tool that encourages them to make more of the right lifestyle choices that can safeguard and promote the health of their brain.

The app offers practical ways for users to reduce their dementia risk, build healthy habits, and track their progress as they strive to optimize and protect their brain health. Small habit changes can have a significant cumulative effect.

BrainFit was made possible with funding from the Public Health Agency of Canada (PHAC) and with support from York University, BitBakery, The Citrine Foundation of Canada, TELUS, RBC, Home Instead, and RB33.

BRAINFIT PROVIDES USERS WITH TIMELY AND SUBSTANTIATED INFORMATION TO FOSTER BRAIN-HEALTHY HABITS TO GET AND STAY BRAIN FIT, ALONG WITH HELPFUL WORDS OF ENCOURAGEMENT AND SUPPORT.

The app is both personalized and customizable, and leverages the latest research findings from leading experts in brain science and medicine, habit formation and behaviour change, app design, and user experience.

The app also includes access to the new Mind Over Matter® videos and podcast series and has an extensive "Explore" section focused on empirical evidence and education. The app was engineered by BitBakery Software, a Waterloo, Ontario development company led by CEO Wes Worsfold.

Developing the app aligns with two of their core values: promoting health and wellness and using technology to improve people's lives. "BrainFit helps users to create and develop habits for better brain health and aligns with BitBakery's values of using technology for good."

Daniel Crystal, a UX Manager at Shopify, worked closely with the BitBakery team to enhance the app's usability. "For widespread adoption, the app's user interface must be simple to use. We believe that the more accessible the design, the more people will be inspired to develop and maintain brain-healthy habits."

"Thanks to our partners and those who developed this exciting app, BrainFit has the potential to reach many people across Canada and beyond, and to truly be transformative in helping users prevent or delay dementia," said WBHI President and CEO Lynn Posluns.

Researchers in the Faculty of Health at York University are evaluating the efficacy of the app, led by Dr. Lora Appel, an Assistant Professor of Health Informatics and a Collaborating Scientist at University Health Network, where she heads the Prescribing Virtual Reality (VRx) lab, which designs and conducts studies that introduce and evaluate virtual reality therapeutic interventions for patients, caregivers, and healthcare providers in different settings.

"I saw a great potential in collaborating with WBHI to move their successful magazine content into the digital realm," said Dr. Appel. "Most mobile apps related to dementia either provide tools for planning and communicating among family and caregivers or target cognitive stimulation that we now know can help mitigate some of the effects of cognitive decline. However, BrainFit differentiates itself in several ways."

BRAINFIT FEATURES

- Completely private and confidential (no identifying personal data is collected, stored, shared, or used)
- Educates users on how to protect their brain health
- Helps users build brain-healthy habits
- Tracks habits to help users monitor their progress
- Encourages users to stay on track to reach their goals
- Includes articles on the latest scientific evidence, as well as countless tips for maintaining brain-healthy habits
- Provides personal challenges and a curated collection of healthy habits
- Offers cues and rewards for healthy habit formation
- Available for smartphone or tablet, and for iPhone and Android

BRAINFIT ADVANTAGES

- Guides users to help form healthy habits based on each of the "six pillars of brain health"
- Completely free to use, with no hidden content behind a paywall
- Customizable, flexible, and accessible
- Content is continually updated based on the latest research findings
- Designed with the input of diverse participants
- App efficacy evaluated by a leading research team

"With its focus on women, the app sheds light on how sex and gender roles influence the prevalence, progression, and treatment of this condition," Dr. Appel continued. "BrainFit also takes a more comprehensive approach targeting behaviours across multiple aspects of lifestyle and provides practical bite-size tips that are easy to implement and introduce into our everyday routines. For example, if you make fruits visible on your kitchen counter, then you're more likely to pick one up and eat it. We can all use some help identifying this 'low-hanging fruit'!"

> **WHEN IT COMES TO MANAGING YOUR PHYSICAL AND MENTAL HEALTH, THE BEST WAY TO STAY FIT AND MAINTAIN YOUR HEALTH AND INDEPENDENCE IS TO ADOPT GOOD HABITS EARLY. WBHI'S GOAL IS TO HAVE BRAINFIT HELP USERS DO JUST THAT.**

Feedback at any time is always welcome. Users are encouraged to provide their opinions and suggestions on improving the app. Content in the app is updated frequently based on user experience and new research findings.

"BrainFit helps you develop brain-healthy habits and supports you to integrate those habits into your busy life with suggested behaviours, practical tips, gentle prompts, and lots of encouragement. There are no hidden costs to sign up, gain access to app features, track your achievements, or see the best content," Posluns added.

Available for both iPhone and Android, BrainFit-Free Habit Tracker launches this December in the app store.

This initiative has been made possible through a financial contribution from the Public Health Agency of Canada. The views expressed herein do not necessarily represent the views of the Public Health Agency of Canada.

Change of Habit

HARNESS THE POWER OF HABITS TO IMPROVE BRAIN HEALTH

Sustaining healthy behaviour change is challenging. Even when we understand that a particular change would be good for us (e.g., eating better, exercising more, flossing our teeth), and even if we feel highly motivated to make that change, it is nevertheless difficult to engage in that new behaviour consistently, particularly over the long term. Every now and then, inspiration may strike – perhaps on New Year's Eve or after a doctor's appointment – and we declare a commitment to start or stop a particular behaviour. That declaration may be followed by an initial spurt of enthusiastic positive change, but far too often our efforts ultimately wane, and we revert to our usual behaviours.

This starting and stopping may become a pattern as we continue to attempt to make the change permanently "this time," similar to what happens with yo-yo dieting or addiction relapses, for example. It can be quite discouraging to attempt a change and fail, even more so if it has happened on multiple occasions. As a result, some people give up entirely on even attempting to change anything.

PART OF WHAT MAKES BEHAVIOUR CHANGE SO DIFFICULT IS THE APPROACH THAT PEOPLE COMMONLY USE – NAMELY, RELYING ON MOTIVATION AND WILLPOWER, BOTH OF WHICH ARE HARD TO MAINTAIN CONSISTENTLY.

Even if that approach does succeed, it is taxing and requires us to consciously (and repeatedly) make the right choice. This is not the only approach to behaviour change, though. We can instead try tapping into habit formation.

Our minds form habits naturally – some positive, some neutral, and some negative. Habits are the behaviours we engage in automatically, without any conscious thought about them, in response to various cues that we have come to associate with those behaviours. For example, most people have a set routine of habits that they do each morning on autopilot. Research suggests that approximately half of our everyday behaviours are the result of habit.

Typically, these habits just develop on their own, as a result of sufficient repetition of the behaviour in response to the cue, shaping our lives without us realizing it. Although our usual patterns will continue to unfold automatically if we do not act, we do have the power to change that by choosing which habits to cultivate.

Some effort is required upfront (i.e., to choose a habit and repeat the behaviour until the habit is established), but eventually it becomes almost effortless to perform the desired behaviour. Little to no conscious attention or motivation is required at that point, so the habits just happen and mental resources are freed up for other tasks.

The amount of effort that is required up front will vary.

Research conducted by Dr. Phillippa Lally and colleagues – published in 2010 in *European Journal of Social Psychology* – found that it takes an average of 66 days to form a new habit, (i.e., to reach a point where performing an action happens automatically, without conscious thought).

However, the range of time varies from 18 days to 254 days. Subsequent research, conducted by Dr. Lally and different colleagues, also found that habit formation varied widely (from four days to 335 days, with a median of 59 days). These later findings were published in 2021 in *British Journal of Health Psychology*.

"Our findings indicate that there is considerable variation in how long it takes people to form a habit. The time it takes varies depending on a number of factors relating to the individual and the behaviour," said Dr. Lally, a Senior Research Fellow at University College London who has been studying habit formation for nearly two decades.

THE 21-DAY MYTH

The 21-day myth about habit formation appears to have originated from observations made in the 1950s and 1960s by Dr. Maxwell Maltz, a plastic surgeon. After performing an operation (such as a nose job), Dr. Maltz found that it would take his patient approximately 21 days to get used to seeing her or his new face. His personal experiences led him to conclude that it takes a minimum of 21 days for an old mental image to dissolve and a new one to form. Decades later, Dr. Maltz's observations still appear in numerous self-help books.

"Importantly, these findings highlight that in some cases it can take a very long time to form a habit, much longer than the 21 days many people have heard it takes. That 21-day myth appears to have originated from limited, anecdotal evidence relating to physical changes to your body that was then repeated enough times by enough people for it to become widely believed."

HOW TO CONSCIOUSLY CULTIVATE HEALTHY HABITS

Below are some tips to help you successfully develop new habits that support your brain health.

CHOOSE THE BEHAVIOUR(S)

Most experts agree that it is best to start small, both in terms of the number of behaviours that you target at a time, and in terms of the size/scope of those behaviours. Some suggest focusing on just one behaviour at a time, and sticking with that behaviour until it feels automatic, before targeting another behaviour. Others suggest that you can focus on several behaviours at a time, but that those behaviours should be small.

One expert, Dr. BJ Fogg, author of *Tiny Habits*, recommends focusing on very "tiny" habits, e.g., do one push-up a day. By committing to doing something so tiny, it will feel easy, thereby increasing your motivation to do it. Often, once you perform that one small task or action, you may end up doing more. For example, if you only have to do one push-up, then once you start doing it, you may keep going and end up doing ten or more.

> **EACH ACHIEVEMENT IN BEHAVIOUR CHANGE, NO MATTER HOW SMALL, CAN CONTRIBUTE TO A PERSON'S CONFIDENCE, WHICH IN TURN CAN INCREASE MOTIVATION TO PURSUE FURTHER POSITIVE CHANGES. SMALL CHANGES, DONE SEQUENTIALLY, ACCUMULATE OVER TIME.**

"Forming a habit for beginning a behaviour is one way to help people change. The action itself can then be built up over time. For example, if you want to form a habit for going for a walk/run, focus on forming the habit of getting your exercise clothes on and leaving the house at a specific time each day or week. The first time you may only go for a five-minute walk, the next time six minutes and you can slowly increase your speed, but every time you are building the habit of going out to exercise," explained Dr. Lally.

"People sometimes set out to do too much, too quickly, and don't think through when these new behaviours will fit in their lives. By making clear plans and building up over time, people can achieve great things in the long term." ⟶

SOME BEHAVIOURS DELIVER A BIGGER "PAYOFF" THAN OTHERS, OFFERING RIPPLE EFFECTS THAT IMPROVE MANY ASPECTS OF LIFE. CHOOSING TO FOCUS ON ONE OF THESE TYPES OF BEHAVIOURS WILL HELP BUILD A STRONG, HEALTHY FOUNDATION.

Four of the "six pillars of brain health" are examples of such keystone, foundational behaviours – namely, sleep, exercise, nutrition, and stress management. Exercise, for instance, helps to improve your brain and cardiovascular health directly, but also decreases stress, improves mood, and gives you energy – all of which help you commit to other positive habits.

So, consider focusing on one of these brain health pillars first if you want to boost the impact of your habit-formation efforts. Be specific about exactly what behaviour you are going to focus on in a particular pillar. For example, do not just commit to exercising more. Instead, commit to a specific type of exercise, of a particular duration, at a particular time.

CHOOSE THE CUE

Habits form when a behaviour is repeated consistently in response to a particular cue (i.e., doing the behaviour again and again in the same situation such as drinking a glass of water with every meal or pausing for three mindful breaths everyday upon waking).

THE CUE IS ESSENTIAL TO HABIT FORMATION BECAUSE IT IS WHAT TRIGGERS THE BEHAVIOUR AUTOMATICALLY.

Without it, you are back to relying on motivation and willpower, and the behaviour is not actually a habit.

"To develop a habit, it's essential that you choose the context in which you will consistently perform the behaviour. That context can be any cue, for example, an event, such as when you get to work, or a time of day, such as after breakfast," explained Dr. Lally. "Whatever cue you choose needs to be something that is encountered in your life consistently so that it can reliably trigger the desired behaviour."

REPEAT THE BEHAVIOUR CONSISTENTLY

Repetition is a key ingredient in new habit formation, especially in the early stages. Habits become stronger with repetition. For many habits, the strength of the habit grows rapidly in the beginning and then levels off. In other words, the early repetitions are especially important to getting the habit established.

THE MORE OFTEN YOU REPEAT A BEHAVIOUR, THE FASTER A HABIT IS ESTABLISHED.

Accordingly, those behaviours that you engage in on a daily basis or even multiple times a day "can become habitual more quickly than things you do once a week or once a month," Dr. Lally continued.

Consistency is important, so aim to do the same behaviour in response to the same cue every time. If you vary the cue (e.g., change the timing of when you do the behaviour), you will weaken the habit, and will need to rely on motivation and willpower. You do not have to achieve perfect consistency to develop a habit, though.

"If you miss the occasional opportunity to do your chosen behaviour, you do not significantly impact the habit formation process," said Dr. Lally. "So, don't be concerned if you miss your behaviour once in a while. That doesn't appear to undermine your progress, as long as you get right back to doing the behaviour. However, multiple omissions of the behaviour will impede the habit formation process."

Some people find it helpful to track their target behaviours to encourage consistency.

It can be inspiring to see how many times you can repeat a behaviour without "breaking the chain." Some people record their behaviours in a notebook, and others use habit-tracking mobile applications. (Women's Brain Health Initiative has recently launched an app that helps assist people in developing habits that support brain health as they age. You can check it out at womensbrainhealth.org/brainfit).

ADJUST YOUR ENVIRONMENT

Our behaviour is heavily influenced by our surroundings, whether we realize it or not. Other people and our physical environment can support or undermine our behaviour change efforts. While you cannot control everything about your surroundings, there are lots of things that you can do to adjust your environment to make it more supportive. For example:

- If you want to remember to eat an apple for a morning snack, display the apples in a prominent location in a beautiful bowl on the counter. (It can also help to get unhealthy choices out of the house, or at least hide them out of sight.)
- If you want to go for a walk every day after dinner, find a neighbour that is committed to going as well, and perhaps buy yourself a comfortable pair of new shoes and store them in an easy-to-access location.
- If you want to meditate first thing upon waking but your current habit is to look at your phone, place the phone in another room before you go to bed to remove that temptation.

BUILD IN ACCOUNTABILITY IF THAT INSPIRES YOU

Some people do better at engaging in a new behaviour if there is some level of accountability involved. Consider seeking opportunities to be accountable to others, perhaps by hiring a personal trainer or nutritionist, or by joining a running group. Alternatively, you might just be accountable to yourself, perhaps boosting your motivation to stick with your plan by sharing your intentions publicly.

BE KIND TO YOURSELF & REASSESS IF NECESSARY

Occasional setbacks are inevitable. When they happen, let your internal "voice" be understanding, and just get right back at it. Remember, research shows that missing a behaviour occasionally does not completely undermine the automaticity of the habit. Progress is the goal, not perfection.

If you continuously fail to establish a particular habit, you could consider adjusting the chosen behaviour (perhaps making it smaller) or choosing an entirely different behaviour that could still support your goals (e.g., maybe you are just not into jogging but would love dancing).

"The more you enjoy a behaviour, the faster you will form a habit. So, choose things that you like to do or add elements to make them even more enjoyable," noted Dr. Lally.

"For example, I like to listen to audiobooks when I run, so even if I'm not feeling like running, I look forward to it because I want to hear what happens next in my book."

MAKE TIME FOR HEALTHY HABITS

Sometimes we do not even attempt to adopt a new habit because we think that we do not have the time. If that is the case for you, pause to ask yourself, whether or not that is really true. Certainly, some people do have very full schedules, but many people do not so much lack the time as they lack sufficient energy or motivation.

Consider switching up what you do with your leisure time.

Do you spend a lot of your spare time sedentary with your eyes glued to a screen? (Canadians are reported to spend more than 22 hours a week watching television, and more than four hours a day on mobile applications.) People who watch a lot of television or spend a substantial amount of time on their phones have time to incorporate more healthy behaviours into their day.

Use conscious habit-formation to shift your patterns away from screens to something else, or pair your screen time with other activities, e.g., walk on the treadmill while watching a show or movie. There are so many things that you could do to support your brain health in enjoyable ways with repurposed leisure time – exercising, meditating, reading books, socializing, doing puzzles, playing an instrument, taking a course, cooking healthy food, and/or simply getting more sleep!

START NOW

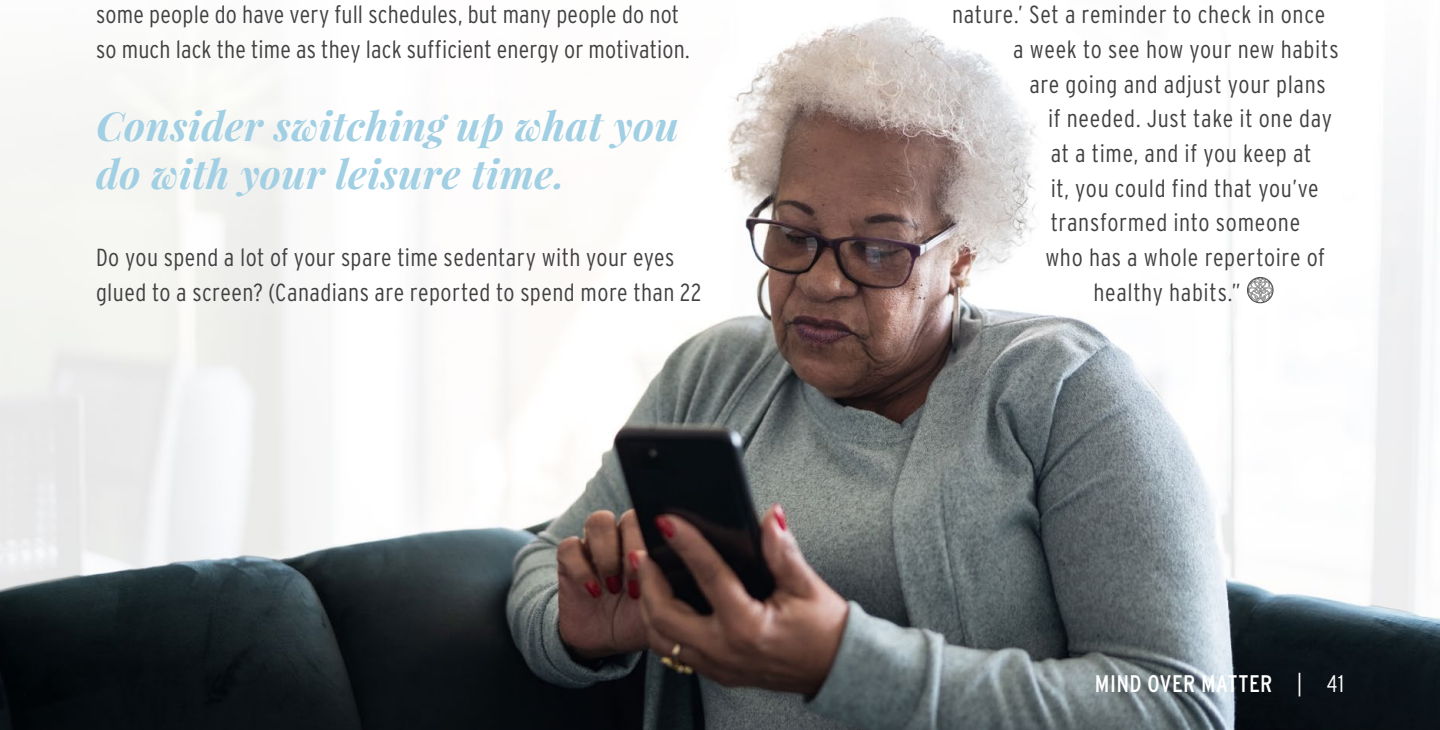
Do not wait until some ideal future time to introduce a positive new behaviour.

> **NOW IS THE PERFECT TIME, ESPECIALLY IF YOU CHOOSE SMALL, SIMPLE ACTIONS TO GET STARTED.**

Remember that if you harness the power of habits to change your behaviour, you only have to stay highly motivated during the time that it takes to establish the habit. After that, engaging in the new behaviour gets progressively easier.

"Knowledge on its own is not enough to change behaviour. Knowing what you should do does not always translate into actually doing it. Habits, when developed consciously, are an incredible way to support gradual, lasting, easier change," said Dr. Lally.

"Simply be clear about what you will do and in what situation, and then do it consistently. Over time, the habit will get stronger and stronger until the behaviour becomes 'second nature.' Set a reminder to check in once a week to see how your new habits are going and adjust your plans if needed. Just take it one day at a time, and if you keep at it, you could find that you've transformed into someone who has a whole repertoire of healthy habits."



A Weight Off My Mind

BODY MASS INDEX & COGNITIVE RISK

As we progress from childhood to adulthood, our bodies and metabolism change to meet the demands of growth and development. Once we reach adulthood, however, our bodies strive to achieve (and maintain) biological homeostasis where there is balance in our internal systems that regulate, amongst other things, appetite, energy, body weight, and blood pressure, despite changes in external conditions.

This ability to adapt and reach balance is important for health and optimal functioning of our systems (e.g., nerves, heart, and muscle). When internal processes and systems are out of balance, this puts stress on the body. Prolonged disruption of homeostasis increases the risk of developing chronic diseases and disorders.

Body mass index (BMI) is calculated by dividing a person's weight in kilograms by the square of her or his height in metres. BMI is typically used as a clinical screening tool because it has a moderate positive correlation with body fat and a strong positive correlation with cardiometabolic disease outcomes (e.g., heart disease and diabetes).

As height stabilizes once we reach adulthood (with a slight decline in older adulthood), significant changes in BMI among adults are the result of changes in weight. Weight loss or gain may be due to a host of endocrine (hormone), metabolic, and/or lifestyle changes.

For instance, older adults may lose weight due to bone loss and loss of muscle. Weight gain may result from combinations of eating more food (input), slowing metabolism, and decreasing activity levels (output).

DECADES OF HIGH-QUALITY RESEARCH SHOW THAT FLUCTUATIONS IN WEIGHT LEAD TO DISRUPTIONS ACROSS SEVERAL BODY SYSTEMS.

For example, weight gain puts added strain on the cardiovascular system (e.g., blood pressure and volume), where the heart must increase output to additional tissues. Excess body fat can lead to build up on the arteries (atherosclerosis) and increase the risk of heart disease.

Yo-yo dieting (i.e., cycles of weight gain and loss) can increase the risk of insulin resistance, which is a precursor for type 2 diabetes. Rapid weight loss can compromise kidney function and increase the risk of developing kidney stones and kidney failure.

While these outcomes of changing weight in adulthood are well established, emerging research also suggests that weight fluctuations, tracked using body mass index (BMI), can have a negative effect on brain function.

BODY COMPOSITION & COGNITIVE RISK

BMI is sometimes used as a proxy for body composition (e.g., proportion of body fat to muscle) to assess health risk. A major limitation in using BMI to calculate health risk is that it cannot provide information about the distribution of weight, and specifically the distribution of body fat.

There are conflicting findings related to BMI and cognitive decline in aging populations, which may be due to differences in fat distribution and therefore differences in cardiometabolic stress.

STUDIES HAVE SHOWN A POSITIVE, NEGATIVE, OR A U-SHAPED RELATIONSHIP BETWEEN BMI IN MIDDLE AGE AND THE RISK OF DEMENTIA.

As an example, Dr. Tzeyu L. Michaud and colleagues followed over 1,000 older adults (with an average age of 78) newly diagnosed with dementia between 0.5 and 11 years. Published in the *Journal of Alzheimer's Disease* in 2019, after controlling for cardiometabolic comorbidities (i.e., congestive heart failure, diabetes, stroke, hypertension, and hypercholesterolemia), findings showed that the progression of dementia was slower in those with high BMI (27.5 and above) compared to moderate BMI (20 to 27.5) and low BMI (less than 20).

One possibility, referred to as the "survival bias effect," was that participants with high BMI who survived to older adulthood were in a better state of homeostasis and therefore had healthier brains because cardiometabolic risk factors were properly managed and controlled.

When men were examined separately, data showed a U-shaped relationship where low and high baseline BMI were associated with a greater progression of dementia when compared to men with moderate BMI. Although not examined, it may be that the protectiveness of high BMI falls out because of differences in fat distribution between women and men.

MEN WITH HIGH BMI ARE MORE LIKELY TO HAVE HIGHER CONCENTRATIONS OF VISCERAL FAT, PLACING A GREATER BURDEN ON THE CARDIOMETABOLIC SYSTEM (EVEN WITHOUT PROGRESSION TO COMORBIDITIES), WHILE WOMEN WITH HIGH BMI TEND TO HAVE MORE SUBCUTANEOUS FAT.

There may also be differences in hormonal regulation related to fat distribution, which necessitates additional research to determine its effect on brain health.

CHANGES IN BMI & COGNITIVE DECLINE

Researchers at the Icahn School of Medicine at Mount Sinai in New York have found that maintaining your weight when you are older may protect brain health. Published in *Alzheimer's & Dementia: The Journal of the Alzheimer's Association* in 2021, Dr. Michal Schnaider Beeri and colleagues examined clinical data from nearly 16,000 adults with normal cognitive function over 60 years old (with an average age of 74) for approximately five years. Their study sought to understand how BMI relates to cognitive decline. →

Participants were classified using standards from the World Health Organization for underweight or normal weight (less than 25kg/m^2), overweight (between 25 and 30kg/m^2), and obese (greater than 30kg/m^2). They were then split into three groups: those with a significant decrease in BMI over time (5% change or more), a stable BMI over time (less than 5% change), or a significant increase in BMI over time (5% change or more).

Cognitive function was assessed using standardized tests that measured episodic memory, attention and working memory, language, and executive function. Results showed that participants in all groups (with and without changes in BMI) experienced decline in cognitive function over the period of the study, in part because of the natural aging process.

However, there were surprising differences in the rates of decline among groups. When compared to the stable BMI group, the group with a significant decrease in BMI (i.e., those who lost weight) had a 64% faster decline in cognition, and the group with a significant increase in BMI (i.e., those who gained weight) had a 62% faster decline in cognition.

THIS PATTERN HELD TRUE FOR BOTH WOMEN AND MEN, WHETHER THEY STARTED OFF AS NORMAL WEIGHT, OVERWEIGHT, OR OBESE, SHOWING THAT ANY FLUCTUATIONS IN BMI OVER TIME WERE ASSOCIATED WITH POORER OUTCOMES IN BRAIN FUNCTION.

When dimensions of cognitive ability were assessed separately, changes in BMI were associated with accelerated decline in three of the four areas: episodic memory, attention and working memory, and language. There was no significant decline in executive function for those with stable, increased, or decreased BMI.

People with higher concentrations of visceral fat appear to have an "apple" shape, storing fat around the midsection, while those with higher concentrations of subcutaneous fat tend to have a "pear" shape, storing fat around their hips, buttocks, and thighs.

Studies have clearly established that people with higher concentrations of fat surrounding the central organs (i.e., visceral fat) are at greater risk for developing cardiometabolic diseases (e.g., coronary artery disease, diabetes, stroke, and hypertension) than those with higher concentrations of fat below the skin (i.e., subcutaneous fat).

COGNITIVE DECLINE MAY DRIVE WEIGHT LOSS & BEING OVERWEIGHT MAY DRIVE COGNITIVE DECLINE

A recent study published in *Scientific Reports* in 2021 looked at the nature of the relationship between BMI and brain health (i.e., cognitive abilities).

Intrigued by previous studies that had demonstrated associations between being overweight/obese in midlife and lower cognitive abilities, as well as associations between lower cognition and higher BMI due to unhealthy lifestyle factors (e.g., poorer nutrition), Dr. Ida K. Karlsson and colleagues sought to learn more about the direction of the relationship between cognitive abilities and BMI, and whether there were differences among women and men.

In this groundbreaking study, the team of scientists examined up to 11 sets of longitudinal data from the Health and Retirement Study (HRS) in the United States across 21 years. The HRS looks at a nationally representative sample of adults aged 50 and older, as well as their spouses.

Participants were interviewed (by telephone or in-person) every two years from 1996 until 2014 with new groups added every six years. Data from nearly 24,000 individuals with European ancestry were included in final analyses. BMI was calculated from self-reported height and weight, and a cognition index was calculated from measures of episodic memory (e.g., word recall) and mental status (e.g., counting backwards and naming objects).

FINDINGS SUGGESTED THAT THERE WAS A BIDIRECTIONAL (TWO-WAY) RELATIONSHIP BETWEEN WEIGHT (BMI) AND COGNITIVE ABILITY THAT WAS DRIVEN BY SEPARATE MECHANISMS FOR ADULTS ACROSS ALL AGES (50 TO 89 YEARS).

As Dr. Karlsson and colleagues explained, "a higher BMI has a negative impact on cognitive functioning throughout midlife and late-life, while at the same time a higher cognitive functioning is protective against decline in weight, especially at older ages."

What this means is that those with higher BMI in midlife tended to have more dramatic loss in cognitive function as they progressed to older adulthood. This effect was more pronounced among men when compared to women. At the same time, participants with declining cognitive function over time tended to show greater weight loss, regardless of whether they were women or men.

While the exact mechanisms responsible for BMI variability and cognitive decline (in the study conducted by Dr. Beeri and colleagues) and the two-way relationship between BMI and

cognitive functioning (in the study conducted by Dr. Karlsson and colleagues) were not examined, these longitudinal, large-scale data sets both show that reaching and maintaining a healthy weight is important for brain health.

Disruptions (fluctuations) in weight homeostasis – whether weight gain or weight loss – can signal issues in brain health and achieving a healthy weight in adulthood may be especially important for men.

REGULAR PHYSICAL ACTIVITY MAY OFFSET COGNITIVE DECLINE FOR OVERWEIGHT ADULTS

While there are many lifestyle factors that can help to maintain BMI homeostasis (and avoid fluctuations), emerging research suggests that regular physical activity may be particularly beneficial. This cognitive boost is in addition to the well-established effects of physical activity on cardiometabolic and mental health.

Recent research conducted by Dr. Isabelle Pitrou and colleagues sought to determine whether regular physical activity played a role in the association between BMI and cognitive decline. Published in the *European Review of Aging and Physical Activity* in 2022, the authors looked at a sample of over 1,000 adults with normal cognitive functioning in Quebec, Canada at two points in time, three years apart.

Physical activity was self-reported and split into high and low levels. High physical activity was defined as seven or more sessions of moderate to vigorous physical activity (e.g., movement that makes you sweat such as brisk walking) for at least 20 minutes per session.

This definition of high physical activity was intended to capture participants who were roughly meeting the Canadian Physical Activity Guidelines for adults, which recommends 150 minutes of moderate to vigorous physical activity per week.

Cognitive functioning was assessed by the validated Mini-Mental State Examination (MMSE) that includes measures of memory and language. As with the large-scale studies cited previously, BMI was calculated from self-reported height and weight.

FINDINGS SHOWED THAT PHYSICAL ACTIVITY MODERATED THE RISK ASSOCIATIONS BETWEEN BMI AND COGNITIVE DECLINE FOR OVERWEIGHT PARTICIPANTS AND FOR PARTICIPANTS WITH METABOLIC AND CARDIOVASCULAR DISORDERS.

For instance, individuals who were overweight that engaged in high levels of physical activity had a lower risk of cognitive decline, but this protective effect was not evident for those who were overweight who engaged in low levels of physical activity. These results highlight the importance of adopting a physically active lifestyle to maintain brain functioning and brain health, with the possibility of additional protection for individuals who are overweight.

Dr. Guy Faulkner, Professor at the University of British Columbia and Chair in Applied Public Health through the Canadian Institutes of Health Research-Public Health Agency of Canada, explains that although the association between physical activity and cognitive functioning is complex, there is "increasing evidence supportive of a positive link across the lifespan and for cognitive impairment in later life. There is some support for a causal connection."

"Given evidence that physical activity improves both physical and cognitive function among older adults, adopting a physically active lifestyle should be considered a vital part of successful aging," he added.

Overall, it appears that our bodies and minds function best when systems are in balance as we progress through the various stages of adulthood. Stable weight and healthy fat distribution appear to preserve cognitive function, with added benefits for those who engage in high levels of physical activity.

Research highlights the importance of including BMI as part of annual check-ups to help identify individuals at risk for cognitive decline. Tracking BMI among adults is simple, non-invasive, and only requires measurements of height and weight. If BMI fluctuations are identified early, this could help facilitate early intervention to delay or offset the progression to dementia.

Write it Down

THE BRAIN BENEFITS OF JOURNALING

Writing in a diary is an activity that many children and youth experiment with, using the practice as a tool to help them explore who they are and deal with any issues in their lives. The practice of writing regularly (which is referred to by many terms, including "journaling") is certainly helpful during that stage of life, but it can also be beneficial at any age.

There are many different types of journaling and varying reasons for engaging in this practice. Some people use a journal to record information about their lives, perhaps tracking habits or the highlights of each day as a historical record. Others use journaling to capture ideas, or to explore thoughts and process emotions.

Research conducted over the past several decades has shown that certain journaling practices can have a positive impact on various indicators of physical and psychological health and well-being. Importantly, journaling can even help strengthen memory. In this article, we share some highlights from that research.

Check out Women's Brain Health Initiative's journal – available at hopeknot.org for $25.00. It is a beautiful 120-page journal with ample space to write, and contains inspirational and informative messages about the best ways to protect your brain health.

EXPRESSIVE WRITING

One form of journaling called "expressive writing" has been studied extensively. The standard technique used in expressive writing research involves randomly assigning participants to one of two or more writing groups. The participants are typically asked to write about an assigned topic for 15 to 30 minutes a day, for one to five consecutive days (so, in total, quite a small amount of time spent journaling).

Participants in the control group are usually asked to write about superficial topics such as how they spend their time each day, while participants in the experimental group are instructed to write about their deepest thoughts and feelings about a traumatic experience, conflict, or stressor.

The exact technique used has varied over the years across studies, as researchers examined different variables. For example, the length of individual writing sessions, the number of writing sessions, and the spacing of those sessions over time have varied substantially. Additionally, some studies involved healthy individuals, while others involved participants with varied conditions and diseases.

You might guess that dredging up negative experiences and/or emotions would have undesirable consequences, and in the short term, that can be true. Participants who engage in expressive writing about traumatic topics often find it emotionally painful during the days of writing, and may temporarily experience increased distress, a worse mood, and more physical symptoms. However, most (but not all) studies have found long-term improvements for the expressive writers, compared to the control group participants.

Reviews of the collective pool of expressive writing research have found that overall it is modestly effective at improving many physical and mental health outcomes. Specifically, expressive writing has been linked in different studies with:

- lower blood pressure;
- enhanced immune function;
- improved lung and liver function;
- better mood and sleep;
- reduced depression symptoms;
- improvements in post-traumatic stress disorder (PTSD); and
- better quality of life.

Why would writing about something traumatic have such positive effects? One possible explanation is that suppressing emotions about negative events from the past is stressful, and stress negatively impacts health in a myriad of ways. By writing about difficult emotional experiences, one can relieve some of that stress. Indeed, research has shown that when people write about deeply personal topics, their body's immediate response is consistent with what is observed in people who are relaxing – in particular, positive effects on the autonomic nervous system (such as a decrease in blood pressure and heart rate). Just as talking about challenging situations with a therapist and/or loved ones can help people feel better and improve health, so can writing about such topics.

Yet another benefit of expressive writing is improved working memory. (Working memory is the small amount of information that is held in the mind temporarily for use in executing cognitive tasks. This is in contrast with long-term memory, which is the vast amount of information stored over a lifetime.)

Researchers believe that the boost to working memory happens because working memory has limited capacity, which can be partly taken up by ruminative, stressful thoughts. Writing about traumatic/stressful experiences helps to remove them from your mind, thereby freeing up mental resources for other matters. With fewer intrusive and negative thoughts, working memory improves.

POSITIVE AFFECT JOURNALING

Initially, expressive writing research focused on writing about traumatic and stressful experiences. Later, the research expanded to consider what if people write about positive aspects of their lives and themselves – an approach that some researchers refer to as "positive affect journaling."

Research has found links between positive dispositions and states (such as optimism and happiness) and a variety of beneficial outcomes, including fewer physical symptoms, better quality of life, improved relationships, and even increased longevity.

The thinking was that writing about positive thoughts and/or experiences might help a person shift to be more optimistic or happy, and she or he would correspondingly experience some of these benefits. Studies have indeed discovered that individuals who engage in positive affect journaling do experience psychological and physical benefits.

For example, one interesting study of online positive affect journaling was conducted by Dr. Joshua Smyth and colleagues and published in 2018 in *JMIR Mental Health*. That study, involving 70 participants with various medical conditions who were experiencing mild to moderate anxiety symptoms, looked at the impact of positive affect journaling on mental distress, and psychological, interpersonal, and physical well-being.

Half of the participants received the usual care (i.e., served as the control group) while the other half completed 15 minutes →

Did you know that chronic stress negatively impacts brain health and cognitive function, and can increase one's risk of developing dementia? It is no surprise, then, that stress management has been included as one of the "six pillars of brain health."

of online positive affect journaling three days each week for 12 weeks. In each online journaling session, participants would respond to one of seven commonly used positive affect prompts (e.g., What are you thankful for? What did someone else do for you?).

Compared to the control group, the participants who journaled experienced reduced mental distress, anxiety, and perceived stress. They also experienced an increase in their perception of personal resilience and social integration, and fewer days on which pain interfered with their usual activities.

"Overall, our findings suggest that positive affect journaling has the potential to be used as a supplemental intervention for medical patients, to help reduce mental distress, and improve aspects of well-being. It appears to be particularly effective at helping to alleviate elevated anxiety symptoms, which can be common among people who are dealing with a medical condition," said Dr. Smyth, a Professor of Biobehavioral Health and Medicine at The Pennsylvania State University and co-author of the book *Opening Up by Writing It Down*.

"By focusing on the positive, this type of journaling tends to be a more pleasant and uplifting experience, and can help motivate people to engage in and stick with the technique. Further, it is a relatively simple, low-risk, and cost-effective intervention, making it a great option, especially for underserved patients."

GRATITUDE JOURNALING

One type of positive affect journaling that has been studied, and that many people enjoy, is "gratitude journaling." In the research literature, gratitude journaling interventions are sometimes called "three good things" or "counting blessings." Although the exact instructions for gratitude journaling have varied across studies, typically the practice involves writing about the things you are grateful for on a regular basis, sometimes daily but sometimes less frequently, sometimes in a simple bulleted-list format, and other times in more depth.

Dr. Leah Dickens is one researcher who has examined the collective research on gratitude interventions, including gratitude journaling, by conducting a meta-analysis of 38 research papers. That meta-analysis – published in *Basic and Applied Social Psychology* in 2017 – revealed that gratitude interventions can lead to improvements in some outcomes, including well-being, happiness, life satisfaction, and mood.

"Although the magnitude of the effects was small, gratitude journaling is a simple, no-cost activity that individuals can do on their own to help them feel happier and more satisfied with their lives over time," explained Dr. Dickens, an Assistant Professor at Kenyon College.

"That makes gratitude journaling a great technique to try if you want to increase your appreciation for the small things in life and learn to view the world through more grateful eyes consistently. By doing so, your psychological well-being may improve, and your physical health might improve as well."

GIVE JOURNALING A TRY

An exact "prescription" for ideal journaling has not been definitively determined, i.e., who should write about what, for how long per writing session, how often, and over how long of a period to optimize the benefits. However, there is little to no risk to journaling, so consider giving it a try. Which type of journaling suits each person can differ, based on variables such as personality, individual preferences, and goals. So, experiment – try out two or more types of journaling and notice how each makes you feel.

In addition to the types of journaling previously described, there are others you might want to consider. For example, one popular form of journaling known as the "Morning Pages" is promoted by creativity expert and author, Julia Cameron. The Morning Pages technique involves handwriting three pages first thing every morning, recording anything that crosses your mind (i.e., stream of consciousness writing).

Cameron explained that the Morning Pages "provoke, clarify, comfort, cajole, prioritize, and synchronize the day at hand." The exact effects likely vary depending on what you ultimately write about. Anecdotal evidence suggests that writing in this way every morning helps jumpstart creativity. (You can also boost and express creativity through "art journaling" – a loose term for any combination of text with art captured in a notebook of some kind.)

Another form of journaling known as "bullet journaling" (also referred to as "BuJo") is described as "a mindfulness practice disguised as a productivity system" by its creator, Ryder Carroll. Bullet journals contain customized, hand-drawn pages created by each user according to their needs, with entries tagged using a system of bullet points and other graphics. Some bullet journals look like works of art, and others are much simpler and may not

be artistic at all. Regardless of how the journal appears, it can still achieve the desired goals of organization, productivity, habit tracking, and reflection if used consistently.

Alternatively, if you want to give yourself some structure and variety, consider purchasing a journaling book that provides different questions and prompts to get you reflecting and writing, along with ample space for your answers.

What should you write about? Some research suggests that the key to journaling's effectiveness is to go beyond just venting. A simple "brain dump" of a bunch of words on the page or repeated rehashing of the same difficult feelings may not deliver some of the physical and psychological benefits described above.

To maximize the impact of journaling, it appears to help if you not only express your feelings on the page, but also record your cognitions related to those feelings – in other words, use writing as a way to process how you are feeling, and look for lessons and meaning if possible.

How long should you write each time, and how often? Research has not yet revealed any hard and fast rules about the ideal length of a journaling session or frequency. So, write for as long as you like and as often as you like. Sometimes once you get going, perhaps aiming for a short amount of time, you will find yourself writing for much longer. Other times, you may find it challenging to write much at all.

The great news is that even small amounts of journaling appear to provide benefits. One study – conducted by Dr. Chad Burton and Dr. Laura King, and published in 2007 in *British Journal of Health Psychology* – had participants write for only two minutes a day, two days in a row.

Participants were assigned to one of three groups and asked to write about: (1) a trauma; (2) a positive experience; or (3) a control topic (either describing the college campus or describing their shoes). Compared to the control group, both the negative and positive journalers reported experiencing fewer physical symptoms four to six weeks after the journaling sessions.

"Our findings showed that health benefits followed just two minutes of written expression, suggesting that one can kickstart valuable emotional processing in a very short amount of time. Of course, these results don't mean that journaling for a longer amount of time is bad, just that the minimum amount of time required to experience benefits may be much lower than previously thought," said Dr. King, a Professor at University of Missouri. "So, even if you're really busy, consider trying short journaling sessions and see if you experience some of the many potential benefits. But feel free to journal for even longer if you have time and enjoy writing."

JOURNALING FOR CAREGIVERS

When you are an unpaid caregiver for a person with dementia, possibly juggling those responsibilities with work and raising a family, you are under a tremendous amount of pressure. Managing it all can be very stressful and self-care often gets put on the back burner right at the time when it is more important than ever.

If you are a caregiver, journaling is an activity that you may want to consider as a method of self-care, as well as a tool to capture important caregiving details. Perhaps you will keep two separate notebooks – one just for you (where you explore your thoughts and feelings, write about ideas and hopes for the future, reflect on and process past memories, etc.) and one that you will share with others who are also involved in caring for your loved one (which perhaps contains a medication log, a list of respite options, emergency contact numbers, and notes about day-to-day happenings – high points, challenges, etc.).

The following are two examples of research studies involving caregivers that show the benefits of journaling for this specific group:

- Researchers in Japan conducted a small randomized controlled trial of a "positive diary" intervention with family caregivers of individuals with dementia. The participants who wrote down three positive things that happened each day, along with the reasons why they chose those things, showed improvement on several measures of well-being. In their paper (published in 2021 in *Perspectives in Psychiatric Care*), the researchers concluded that the positive diary intervention is a useful self-care tool for caregivers of individuals with dementia.
- In a study of female caregivers of individuals with advanced cancer from rural Western Canada, participants completed daily journal entries documenting their hopes and challenges, self-care strategies, and emotional journey. The researchers noted in their paper (published in 2013 in *BMC Palliative Care)* that journaling in this way was particularly valuable for these rural caregivers, perhaps because they are isolated and may lack direct professional and/or peer support.

Suddenly Speechless

APHASIA & THE BENEFITS OF THERAPY

Joni Mitchell surprised the crowd at the Newport Folk Festival on July 24, 2022, when she played her first full-length set in public since suffering a brain aneurysm in 2015 that left her unable to speak, walk, or play the guitar. As she sang, "Don't it always seem to go that you don't know what you've got till it's gone," from "Big Yellow Taxi," it seemed as if she was commenting on her recovery after brain injury more than the negative impacts of paving over paradise.

You may also have recently read about actor Bruce Willis stepping away from acting following an aphasia diagnosis.

Aphasia is an impairment of language, affecting the production or comprehension of speech and the ability to read and/or write, according to the National Aphasia Association.

Aphasia is always caused by brain injury, most commonly from a stroke, but may also result after an aneurysm, head trauma, brain tumour, infection, or deterioration of brain tissue related to Alzheimer's disease or frontotemporal dementia.

Mind Over Matter® spoke to leading aphasia experts to learn more about aphasia, therapy options, common myths and misconceptions, and the research underway seeking to answer outstanding questions in the field.

APHASIA

Aphasia manifests differently in each affected individual. It may cause severe language impairment making communication with others impossible, or it may be mild.

SOMEONE WITH APHASIA MAY HAVE DIFFICULTY RECALLING THE NAMES OF THINGS, SPEAKING IN FULL SENTENCES, AND/OR READING.

Multiple communication abilities are typically compromised yet some are still accessible for limited information exchange.

Most people who acquire aphasia after brain injury are middle-aged or older, but it can affect people of any age who experience a brain injury. Almost one-third of people who suffer a stroke develop aphasia.

According to a meta-analysis of sex differences in post-stroke aphasia published online in December 2018 in *PLOS ONE*, approximately 29.6% of females and approximately 26% of males were diagnosed with aphasia. Further analysis revealed that this difference was most likely attributable to a difference in age: women tend to be older than men at the time of stroke, and older individuals are more likely to develop aphasia after stroke than their younger counterparts.

Aphasia has a profound negative impact on one's quality of life. For example, stroke survivors with aphasia reported significant problems across several quality-of-life measures, including greater anxiety and depression, pain and discomfort, and difficulties with self-care, mobility, and daily activities at 90- and 180-days post-stroke compared to those who did not have aphasia, according to a recent study published in July 2022 in *Topics in Stroke Rehabilitation*.

"The big consequences of aphasia are social isolation and depression," said speech-language pathologist Wendy Duke, founder and Clinic Director of Columbia Speech and Language Services Inc., in Vancouver, British Columbia. "What's worse is mental health professionals are ill-equipped to assess or help people with an impaired ability to speak, listen, read, or write."

The only way to reduce the risk of aphasia is to lower the risk of brain injury through smart lifestyle choices that protect brain health. Mind Over Matter® readers are familiar with essential lifestyle habits for protecting brain health, including eating a healthy diet, getting enough exercise, sleep, and social interaction, minimizing the risk of traumatic brain injury, and following your doctor's advice if you have high blood pressure.

APHASIA THERAPY

Aphasia therapy aims to remediate communication deficits, teach compensatory communication strategies, provide education and counselling, and help affected individuals return to participating in activities of daily life.

Speech-language pathologists with experience treating aphasia assess communication deficits and abilities, as well as develop personalized treatment plans for each patient, taking the severity of their impairment, goals, social support network, and needs into account.

THERE ARE MANY EVIDENCE-BASED INTERVENTIONS FOR TREATING APHASIA DEPENDING ON THE SPECIFIC LANGUAGE IMPAIRMENT.

For example, semantic feature analysis is a common method used to help those with difficulty retrieving words.

While looking at a picture of an object, such as an apple, the participant tries to name the object after answering a series of questions: What type of food is it? What is it used for? What does it do? Where do you find it? What does it make you think of? What does it look like (i.e., colour, shape, and size)? What does it taste, smell, and sound like?

Verb strengthening network treatment is another word retrieval therapy that aims to strengthen words around verbs. The therapist encourages the participant to think about people or things that perform actions and the nouns that receive the actions, such as "daughter drives car."

Additionally, the multiple oral re-reading technique, which involves a participant re-reading text out loud, may be helpful for individuals with difficulty reading (alexia).

These are just a few examples of the many different types →

COMMON TYPES OF APHASIA

Experts have identified common types of aphasia based on patterns of language deficits, including whether an affected individual can speak fluently, comprehend spoken language, and repeat words or phrases.

Global aphasia

The most severe type of aphasia in which individuals produce few understandable words and comprehend little to no spoken language. They cannot read or write.

Broca's aphasia

Speech is halting, effortful, and typically limited to less than four words at a time. Accessing vocabulary is limited and forming sounds is often challenging. Understanding speech and reading may be less affected, yet writing is limited.

Wernicke's aphasia

The ability to comprehend meaning from spoken language is impaired. The individual can speak easily but uses abnormal sentence structure and inserts irrelevant words. Reading and writing are typically very impaired.

Anomic aphasia

The individual is unable to come up with the right words (especially significant nouns and verbs), making speech full of vague approximations.

Primary progressive aphasia (PPA)

Unlike other types of aphasia caused by a stroke or brain injury, PPA is caused by neurodegenerative diseases such as Alzheimer's disease or frontotemporal dementia. Brain tissue important for speech and language deteriorates, causing communication problems initially, and other cognitive difficulties later.

Other aphasia types

Many different combinations of deficits do not fit into the above categories. For example, after a stroke, some individuals may have trouble only with reading (alexia) or both reading and writing (alexia and agraphia).

**Adapted from Aphasia Definitions by the National Aphasia Association.*

of aphasia therapy. "There is a long history of behavioural interventions for poststroke aphasia with hundreds of studies supporting the benefits of aphasia treatment.

However, interventions for aphasia are complex, with many interacting components. No single treatment is appropriate for all persons with aphasia," according to Dr. Leora Cherney, Scientific Chair of the Think + Speak Lab and Director of the Center for Aphasia Research and Treatment at the Shirley Ryan AbilityLab in Chicago, Illinois.

Aphasia therapy may take place one-on-one or in small groups with a speech-language pathologist. A recent therapy delivery method, the Intensive Comprehensive Aphasia Program (ICAP), provides a minimum of three hours of daily treatment for at least two weeks with a small group of individuals participating in the program together from start to finish.

> **THE GOAL IS TO IMPROVE COMMUNICATION AND PROMOTE CHANGES IN THE BRAIN NETWORKS AFFECTED BY APHASIA THROUGH INTENSIVE PRACTICE.**

Several ICAPs are available, including at the Shirley Ryan AbilityLab and the Intensive Treatment for Aphasia in Western Canada (iTAWC) program, which is co-led by Duke in Vancouver, British Columbia.

Speech and language therapy for aphasia after stroke effectively improves communication, reading, writing, and expressive language compared to no treatment, according to a systematic review published in *Cochrane Reviews* in June 2016. The authors concluded that high-intensity, high-dose, or extended-period aphasia therapy may be beneficial but may not be acceptable for all individuals.

Dr. Cherney said that standard aphasia therapy in Canada and the United States is not sufficiently long enough to provide the support required for longer-term gains. She recommended looking for aphasia treatment research studies or group programs facilitated by speech-language pathologists.

The Aphasia Institute of Toronto, for example, offers group programs and trains volunteers who conduct home visits. Some universities offer modified ICAPs, providing therapy for individuals with aphasia and essential training opportunities for speech-language pathology students, Dr. Cherney noted.

DISPELLING APHASIA MYTHS

"Aphasia affects language ability, not intellect," said Duke. "It may look like a cognitive problem because we verbalize thoughts in our minds. That can be challenging for people

with significant aphasia, but it is an indirect consequence not directly related to intelligence."

Another major misconception is that recovery plateaus after a certain amount of speech and language therapy. "In the earliest weeks or even a few months after a brain injury, significant spontaneous recovery occurs, which may include a subsidence of swelling in the brain or reabsorption of extra blood, and early improvements can be dramatic," Duke explained.

"Recovery after that point may slow or come to a standstill for those who do not receive therapy. However, there's always room for improvement if the therapy is appropriately intense and focused. The gains may become smaller over time and harder won but can still occur many years, even ten years later."

As an example, Duke recommended watching YouTube videos of Gabby Giffords, an American politician who experienced severe aphasia and difficulty walking after surviving a gunshot to the head in 2011. "Compare her speech at the Democratic National Convention in 2016 and then four years later in 2020. Her remarkable progress is a testament to continued therapy and hard work over many years."

APHASIA RESEARCH DIRECTIONS

"There are many behavioural interventions, and we know aphasia therapy works, but many questions remain that we are actively investigating, such as optimal dose and timing," said Dr. Cherney.

"For example, should participants practice daily, multiple times per day over four weeks, or a few times per week over a longer period? Also, emerging evidence suggests time gaps between treatments may be beneficial for consolidating learning."

Another question is how early to begin aphasia therapy. "Generally, the earlier the better, but exactly when is an outstanding question. The brain recovers in different ways in the first few days and weeks after a stroke compared to months later," said Dr. Cherney. "Therapy dose and frequency may need to be modified for different recovery periods."

"Typical aphasia treatment is front-loaded and certainly helps participants and their loved ones become educated and involved in recovery," said Duke. "However, if funding is limited, I would prefer to see participants take half of the money spent on therapy in the acute phase of recovery and reserve it for six months or a year after they have completed acute stroke rehabilitation and have a greater awareness of their deficits."

To answer outstanding critical questions about aphasia therapy, Dr. Cherney and colleagues at the Shirley Ryan AbilityLab are measuring whether interventions result in lasting changes in the brain using resting-state functional magnetic resonance imaging before and after treatments at various time points.

"We're not evaluating areas of brain damage; we are evaluating how different brain regions connect to each other and how these connections change after an intervention," she explained. For this work, Dr. Cherney is using some of the behavioural interventions she co-developed, Oral Reading for Language in Aphasia (ORLA®) and Aphasia Scripts®, which are both commercially available and can be performed with a speech-language pathologist or practiced at home using a computer.

Dr. Cherney and colleagues are also investigating whether adding transcranial direct current stimulation (tDCS) to other interventions could be beneficial. This non-invasive, painless treatment uses direct electrical currents applied with a device to stimulate areas of the brain. Currently, tDCS for aphasia therapy is only accessible through clinical trials in Canada and the United States.

Finally, Dr. Cherney and her team are investigating ways to detect anxiety and depression in individuals with aphasia such as measuring eye tracking movements and heart rate variability.

There are many types of aphasia and several therapy options available. If you or a loved one are affected, then keep in mind that while mileage may vary on the road to recovery, important gains are still possible many years after brain injury.

ADDITIONAL APHASIA RESOURCES

Learn more about aphasia and therapy options from:

- **Intensive Treatment for Aphasia in Western Canada (iTAWC), a specialty clinic of Columbia Speech and Language Services Inc. located in Vancouver, British Columbia (itawc.com); and**
- **The Center for Aphasia Research and Treatment at the Shirley Ryan AbilityLab located in Chicago, Illinois (sralab.org/aphasia).**

At-home therapy tools and mobile applications are also available from Tactus Therapy (tactustherapy.com).

Additionally, be sure to visit aphasia.com/virtual-connections-info for free virtual support groups facilitated by speech-language pathologists from Lingraphica.

On the Cover

WITH POOJA HANDA & ARUNA HANDA

When Pooja Handa started learning about the importance of brain health, she realized that her mother Aruna had instinctively been doing all of the right things for decades. "A lot of my new learning is inspired by my mother. She's far better at these things. She could outrun me on the treadmill and she's extremely social," said the co-host of CHFI's morning radio show in Toronto.

All the more gratifying, then, that Pooja gets to appear with her mother on the cover of the 15th edition of the Mind Over Matter® magazine.

> *I'm just so honoured. My mother is incredible – and so is the story of her beginning a new life in Canada.*

When Aruna first arrived in Canada in the 1970s at the young age of 22, she barely spoke any English and knew no one but her new husband Yudhvir, having just wed in an arranged marriage in their native India. The couple moved into a tiny apartment in Toronto and within a year she gave birth to Pooja's older sister, Neeru.

"We had nobody," said Aruna. "It was very tough."

She would write letters home to her parents, her tears smearing the ink on the paper. However, it was not long before Aruna's naturally outgoing personality helped her weave together a network of support.

"I used to knock on the doors of people living in my building and say, 'please talk to me.' Being social is very important to cope with the stress."

One older woman took Aruna under her wing, spending time with her and even cooking meals for the new mother.

"She said, 'anytime you feel lonely, you talk to me.' She was so sweet. I think she came into my life for a reason. She saved me."

Aruna soon made other friends in the building – people who remain close almost 50 years later, and form part of a vast social circle that she has nurtured and built (one reason why 700 people attended the wedding of her younger daughter, Pooja).

The Handas later moved to Mississauga and Aruna began working in the medical records department at Mount Sinai Hospital. In her mid-40s, she discovered that she was pre-diabetic and started taking proactive measures to change her life, including improving her diet, buying a treadmill, and joining a gym.

"It's really a testament that it's never too late to start," said Pooja. "My sister and I saw and learned from her that we should be eating well and exercising regularly."

In retirement, Aruna has not slowed down a bit, seeing friends several times a week and volunteering to cook healthy meals for seniors.

"You feel good doing it. I feel so lucky to help," she told Mind Over Matter®.

A familiar face on morning television in Toronto for many years

before recently transitioning to radio, Pooja was invited by Women's Brain Health Initiative (WBHI) in 2019 to appear in a video promoting the charity's inaugural Stand Ahead® Challenge. It prompted her to learn more about WBHI's mission to promote equity in research and to educate the public about the ways to protect and preserve cognitive vitality.

"I have a degree in women's studies, but it was eye-opening for me to learn how women are disproportionately affected by Alzheimer's disease and other forms of dementia," she said.

"I've learned so much. I didn't know that many of these brain diseases may be preventable."

Already a vegetarian, Pooja has also added some elements of the "MIND diet" to her food choices (a brain-healthy diet that focuses on plant-based foods like whole grains, green leafy vegetables, fruits, and nuts, and limits the intake of animal products and foods high in saturated fat).

NOW, POOJA AND HER MOTHER ARE KEEN TO SPREAD THE WORD AMONG THE SOUTH ASIAN COMMUNITY, WHERE THEY SAY ISSUES OF DEMENTIA ARE RARELY DISCUSSED.

"I learned from Pooja," said Aruna. "I didn't know anything about brain diseases. In our community, we don't talk about it. It's considered very personal, but I think we should talk about it."

Along with a broadcasting career and charity work, Pooja has a new, all-consuming endeavour. In June, she and her husband welcomed their first child, daughter Sia (which means "goddess" in Sanskrit).

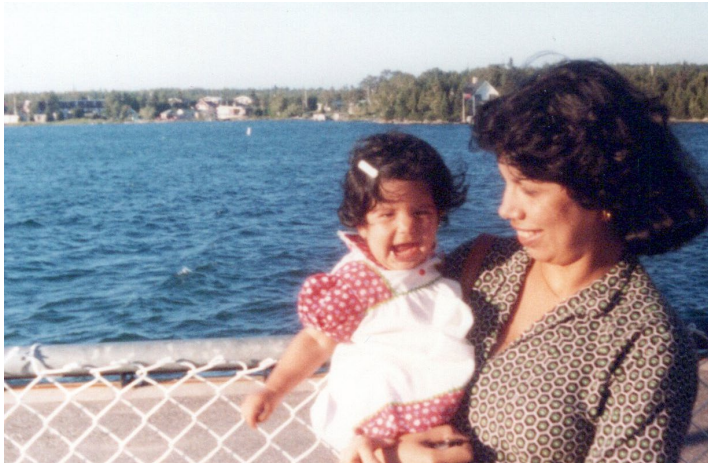
It is a truism among people who work on morning radio or television programs that sleep is an obsession, something shared with new parents. Pooja admits to feeling foggy at times with her new baby.

"Mommy brain is a thing. I definitely have days when it's hard, but then she smiles and it's all amazing. I'm just so grateful. This is something I've prayed and wished for."

The experience has also reinforced the importance of self-care. She is sticking with the long walks that she started taking during pandemic lockdowns, this time pushing a stroller with Sia.

Leading up to the cover photoshoot for Mind Over Matter®, Pooja was reminded of her childhood when her mother would work with her to prepare for dance performances at multicultural festivals.

"This is our thing again, just the two of us. It is so special for us to have this time together and to share this experience."



Stand Ahead

A VIRAL CHALLENGE TO SUPPORT RESEARCH THAT BETTER MEETS WOMEN'S NEEDS

Music is Steve Koven's means of connecting with people. So, it was only natural that he would propose a Stand Ahead® Challenge inspired by his life as a performer, composer, producer, and teacher.

The "Conductor Challenge" requires participants to pretend that they are simultaneously leading two different orchestras that are playing in two different time signatures. With one hand, participants will endeavour to draw an imaginary vertical line for a one-two count and with the other will trace an imaginary triangle for a one-two-three count. Simple coordination-based exercises (like this challenge) can help improve how your muscles work together, as well as brain function and learning.

"I thought this challenge was perfect because it's not only physical but musical. It challenges the brain to do things that it doesn't normally do," Koven told Mind Over Matter®.

Women's Brain Health Initiative (WBHI) supporters agreed and voted the Conductor Challenge as the winner of the 2022 contest, meaning that it will be performed on December 2nd in recognition of Women's Brain Health Day and as part of the charity's annual fundraising initiative.

The first $250,000 raised through the Stand Ahead® Challenge will once again be matched by Brain Canada.

Koven's proposal was selected over two other worthy finalists. The "New Language Challenge," submitted by Nicole Cairns, required

participants to learn how to count to ten in a language that they do not know, while the "One Hand Challenge," submitted by Connie Ross, asked participants to put a shirt on over their top and button it up using only one hand.

"We had so many tremendous submissions and all three of the finalists were great. I'm constantly amazed and inspired by the creativity and enthusiasm of our supporters," said WBHI President and CEO Lynn Posluns.

Steve Koven had never heard of the contest. His sister, who works at Baycrest Health Sciences in Toronto, Ontario, told him about the Stand Ahead® Challenge and urged him to enter.

Koven has a longstanding personal and professional connection to brain health. His father suffered from vascular dementia and Koven was one of his caregivers during the last four years of his life. While performing at his father's retirement home, someone in the audience suggested that he apply for a job at the Bitove Method, an organization that offers arts-based classes for older individuals experiencing memory loss.

Working at the Bitove Method provided Koven with a new and rewarding side to a career that has seen him perform across the globe with his jazz trio, as well as teach at York University and Centennial College in Toronto. Koven is also currently working with seniors at Baycrest.

"It was a whole new way of using my music, not just for creativity but also for healing," he said. "The arts are essential on so many levels. They bring people together and they can trigger memories. They're a very powerful medium to benefit our society."

Koven will also be demonstrating the Conductor Challenge on Women's Brain Health Day.

"I knew nothing about WBHI before this experience. I think it has a great mission to spread the word about brain health and to support research. It's essential."

Too Young to Worry?

EARLY PREDICTION OF ALZHEIMER'S DISEASE RISK

Alzheimer's disease (AD) risk increases with age, and symptoms typically appear in individuals who are 60 years of age and older. As a result, many of us do not tend to give much thought to AD or protective lifestyle measures in early adulthood.

However, certain cardiovascular markers associated with AD risk may be predictive as early as in our mid-30s, according to a recent study conducted by researchers from the Boston University School of Medicine.

> THE STUDY FOUND THAT LOWER HIGH-DENSITY LIPOPROTEIN (HDL) CHOLESTEROL AND ELEVATED GLUCOSE LEVELS AS EARLY AS AGE 35 WERE ASSOCIATED WITH A HIGHER RISK OF DEVELOPING AD IN LATER LIFE.

The findings, published in March 2022 in *Alzheimer's & Dementia: The Journal of the Alzheimer's Association*, suggest that it is essential to be aware of these health markers starting in early adulthood and that careful management to address these issues may potentially lower the risk of developing AD in later years.

"It's well understood that certain cardiovascular and metabolic health conditions, including high cholesterol, diabetes, obesity, high blood pressure, and metabolic syndrome, are predictive risk factors for AD. However, most of that knowledge came from studies of individuals who were 55 to 60 years old at baseline," said senior study author Dr. Lindsay Farrer, Chief of Biomedical Genetics and Distinguished Professor of Genetics at the Boston University School of Medicine.

"To our knowledge, our study is the first to report associations between AD and HDL cholesterol and glucose levels in earlier adulthood."

STUDY CONTEXT

For their study, Dr. Farrer and colleagues used data from the Framingham Heart Study (FHS), a multigenerational, long-term study that has been collecting blood samples, physical examination data, and diagnostic information from residents of Framingham, Massachusetts since 1948.

The initial goal of the FHS was to identify common factors contributing to heart disease, but the study has enabled a treasure trove of insights for other health conditions over time.

Nearly 5,000 study participants, aged 20 to 49 at intake, were examined every four years from 1971 through 2016. The participants were evaluated for cognitive decline and dementia, commencing in 1979, including with the Mini-Mental State Examination (MMSE) starting in 1991 and in-depth cognitive examinations beginning in 1999.

The investigators defined the age of AD onset as the earliest recorded date of cognitive impairment. They calculated whether lipid fractions, glucose, blood pressure, body mass index (BMI), and smoking were associated with AD risk for three groups of study participants: early (ages 35 to 50), middle (ages 51 to 60), and late (ages 61 to 70) adulthood.

KEY FINDINGS

- Higher HDL cholesterol was associated with lower AD risk in early and middle adulthood. A 15 mg/dL increase in HDL cholesterol was associated with an approximately 15% lower risk of developing AD for adults ages 35 to 50 and an approximately 18% lower risk for adults ages 51 to 60.
- Elevated blood glucose was associated with higher AD risk in middle adulthood. A 15 mg/dL increase in glucose measured between the ages of 51 to 60 was associated with a nearly 15% increased risk of developing AD.
- BMI, low-density lipoprotein (LDL) cholesterol, systolic blood pressure, and smoking were not related to AD risk in any age group.

THE RESEARCHERS LOOKED FOR DIFFERENCES IN RESULTS BETWEEN WOMEN AND MEN AND OBSERVED SIMILAR PATTERNS OF ASSOCIATION.

However, there were only 247 cases of AD – an insufficient number for demonstrating a statistically meaningful difference between women and men, Dr. Farrer explained.

EXPERTS WEIGH IN

"The information for our study was collected prospectively over decades, a key strength of the FHS," said Dr. Farrer. "However, the findings don't prove cause and effect. They point to associations from which we can make inferences and generate hypotheses to test experimentally."

Dr. Allison Reiss, Associate Professor of Medicine at the NYU Long Island School of Medicine and a member of the Alzheimer's Foundation of America's Medical, Scientific, and Memory Screening Advisory Board (who was not involved in the study) agreed: "The main findings and implications of the study are good messages, but the findings are associations, not causal relationships. Much work needs to take place to understand these relationships better."

Evidence from other studies may shed light on some of the hypotheses that may explain the findings. For example, other →

LEARN MORE ABOUT ALZHEIMER'S DISEASE & WOMEN

The Alzheimer's Foundation of America (AFA) recently produced "AFA Fireside Chats," an eight-part educational web series to raise Alzheimer's disease (AD) awareness. Each episode features a discussion with an expert from AFA's Medical, Scientific, and Memory Screening Advisory Board.

Episodes are available for free online at alzfdn.org/firesidechat/.

Watch Episode 7 (entitled "Healthcare Disparities for Women") to see Dr. Allison Reiss discuss the disproportionate impact of AD on women and the steps that women can take to reduce their risk and overcome obstacles to care.

scientists have demonstrated in laboratory studies that HDL plays a role in reducing the accumulation and inflammation caused by amyloid-beta, one of the abnormal hallmark proteins thought to be involved in AD.

They have also found that HDL may help reduce amyloid-beta accumulation by transporting it through blood vessels. Finally, an inherited genetic variation, the APOE e4 allele, reduces HDL cholesterol and is known to be associated with a higher risk of AD in adults over the age of 65.

"I suspect the association between a higher HDL and lower AD risk indicates an underlying problem further upstream," said Dr. Reiss. "Emerging evidence shows that the quality of HDL, which was not investigated in the present study, is also important. Medications can boost production of HDL, but if that HDL is of poor quality, it's not helpful."

Scientists have already identified a link between higher glucose levels and elevated AD risk in studies of older adults.

For example, a study published in *Alzheimer's & Dementia: The Journal of the Alzheimer's Association* in March 2018 found that increases in fasting blood glucose were associated with a higher accumulation of amyloid-beta plaques and tau tangles and impaired glucose metabolism in the brain in an autopsy cohort of the Baltimore Longitudinal Study of Aging.

HIGH BLOOD GLUCOSE MAY CONTRIBUTE TO AN ELEVATED RISK OF AD IN DIFFERENT WAYS.

For example, Dr. Farrer and his research team noted evidence from other studies that showed excess glucose could exacerbate neuroinflammation caused by amyloid-beta, alter immune responses in the brain through a process called glycation (in which sugar molecules attach to proteins and cause them to behave abnormally), and make neurons insulin resistant.

"Excess glucose is toxic to neurons, with inflammation playing a big role in causing damage," said Dr. Reiss. "Glycation ruins proteins and also hurts blood vessels in the body, linking back to vascular health issues associated with AD risk."

The researchers also adjusted their results for diabetes, hypertension, and dyslipidemia treatments. "Our findings were somewhat attenuated, but the associations we identified didn't disappear, suggesting that an earlier foundation of risk factors plays a role in the longer-term development of AD," explained Dr. Farrer.

Finally, Dr. Farrer noted that lifestyle factors alone are not solely to blame for the AD risk factors they identified. "Genetic differences can also affect cholesterol levels, glucose levels, blood pressure, and other cardiovascular factors associated with a higher risk of AD and other cognitive health issues."

THE BOTTOM LINE

"Older adults are well aware of the need for annual health checkups, but millennials, for example, tend to assume they are healthy and skip them," said Dr. Farrer. "We hope our findings will encourage more people in their 30s and older to have annual checkups and get screened for blood glucose and lipid levels."

> *Earlier awareness of risk factors may allow them to take steps to prevent AD and other conditions as they age.*

"Once an individual has symptoms of cognitive decline resulting from neurons that have died, those neurons cannot be brought back to life," said Dr. Reiss. "A far better strategy is to keep them from dying in the first place by taking good care of yourself in younger years and reap the dividends later. Don't wait yourself out."

FUTURE DIRECTIONS

Dr. Farrer and Dr. Reiss both agreed that more research is necessary to understand upstream mechanisms that may explain exactly how lower HDL cholesterol and higher glucose raise AD risk. In their respective laboratories, they are actively seeking underlying molecular mechanisms that cause neuronal loss in AD, hoping to identify effective treatment strategies.

"Once amyloid-beta and tau accumulate, it's like a crumbling building. Medications may sweep out the debris, but the building is still falling apart," said Dr. Reiss. "These hallmark proteins are a sign of a degradation process in AD, not the cause, which may be why so many treatments targeting them have failed to produce compelling results in clinical trials."

Dr. Farrer also continues to search for genetic factors that raise AD risk, including those that may be sex specific. Together with colleagues at the Boston University School of Medicine and the University of Chicago, he recently discovered that a new gene called "MGMT," which plays a role in repairing DNA damage, was significantly associated with the development of amyloid-beta and tau proteins in women more so than in men.

In their paper, published in June 2022 in *Alzheimer's & Dementia: The Journal of the Alzheimer's Association*, the researchers noted that further studies are needed to better understand how and why MGMT is associated with higher AD risk in women.

You've Got a Friend in Me

THE BENEFITS OF ADULT DAY CARE

Dedicated community resources for senior adults who require specific supervision, services, and care is becoming increasingly popular among the aging population – for both participants and their caregivers.

Adult day services, also commonly referred to as "adult day care," is a growing approach to short-term supervised healthcare provided to older adults who suffer from various health conditions (such as Alzheimer's disease and other types of dementia) or who are experiencing cognitive decline.

ADULT DAY CARE IS ALSO BENEFICIAL FOR THOSE INDIVIDUALS WHO ARE ISOLATED OR LONELY THAT COULD USE SOME LEVEL OF SOCIAL INTERACTION BUT REQUIRE SUPERVISED CARE.

At an adult day care centre, a strong network of trained professionals provides participants with specialized care in a safe and secure setting. Participants engage in a variety of activities based on their individual conditions and capabilities, including partaking in exercise regimes (e.g., yoga, Pilates) →

and arts and crafts, playing music and games (e.g., bingo, Scrabble, and memory-related activities), and discussing literature and films, as well as receive medical and other health-related services if required (e.g., therapy, special needs support, medication dispensing, and blood pressure monitoring).

Adult day care centres meet the needs of many older adults who require limited care and only fluctuating day services support.

The benefits of this approach to healthcare are both social and medical, and support the independence of an individual living in her or his community, and may help delay the transition into a long-term care facility.

The Benefits of Adult Day Services

- Safe and secure
- Supervised
- Social (reduces some of the feelings of isolation and loneliness)
- Interactive
- Improves quality of life
- Promotes independence
- Decreases caregiver stress (offering a break and emotional support, and alleviating burnout)
- Less expensive than long-term care
- Helps individuals form relationships with others
- Community-based care

There are a variety of names for adult day care facilities. In Australia and some European countries, the terms "respite" and "community care" are more common, while other countries may use the terms "community outreach," "nursing homes," and/or "support groups."

Regardless of the specific name, when analyzing the global adult day care services market, adult day services are leaders in community-based care for individuals with Alzheimer's disease and other types of dementias. In fact, research indicates that nearly half of all participants have some level of dementia.

Additionally, approximately 90% of centres offer cognitive-stimulation programs, nearly 80% provide memory training programs, and more than 75% offer educational programs.

THE CARE PROVIDED BY ADULT DAY CARE MAY DELAY NURSING HOME PLACEMENT.

One of the global driving forces for adult day care centres is the National Adult Day Services Association (NADSA). The organization connects providers, educators, caregivers, and participants, offering education and resources to the global community and its membership.

WHAT TO LOOK FOR IN AN ADULT DAY SERVICE OFFERING

When looking for adult day service support, it is important to research the various service options available to find the specialized care that aligns with the unique needs of an individual.

According to a recent report by Forbes, there are more than 7,500 adult day care centres in the United States that provide services to older adults and approximately 80% of those programs have a nurse on staff, and nearly 50% employ a social worker. While onsite medical resources are critical, there are several additional factors worth considering, including:

- **REPUTATION** – How long has the centre been in operation? Are there any testimonials? Can you speak with any caregivers about their participants' experiences?
- **CREDENTIALS** – Does the centre have any accreditations and/or licenses? How about their workers that interact with the participants? Any medical training?
- **LOCATION AND HOURS** – Where is the centre located? Are there any outdoor opportunities that are safe? What are the hours of operation? Does that align with the caregiver's schedule?
- **MEALS AND SNACKS** – Does the centre offer meals and/or snacks? Can they accommodate special dietary requirements if necessary?
- **SERVICES** – What level of services are provided? Basic services may include eating, medication management, and washroom support, while more advanced services may include specialized care for cognitive issues and physical therapy.
- **TRANSPORTATION** – Does the centre offer door-to-door transportation for participants? If so, what is the cost?
- **COST** – Is the centre a non-profit organization, medical centre, or senior organization? Costs may vary depending on the level of care offered and while such costs are not typically covered by insurance, financial assistance may be available.

In addition to researching the different options in your area, it is also highly recommended to visit the locations personally to better assess the environments and observe participants and staff in their interactive state.

If you require assistance locating an adult day care centre near you, consider reaching out to your local area dementia and Alzheimer's associations to see what is available. The NADSA also provides links to the international network of adult day care centres on its website.

QUESTIONS TO CONSIDER DURING A SITE VISIT:

- Do the participants seem happy and engaged when you are walking through the facility?
- What is the noise level like? Are there quiet areas as an alternative to the busy areas?
- What is the staff-to-participants ratio?
- Is it clean, organized, and safe? Any unpleasant odours?
- Is the space wheelchair accessible? Is there comfortable furniture that is conducive for lengthy intervals of sitting? How accessible are the washrooms?
- Are the meals and snacks healthy, decided by a qualified diet expert, and sensitive to participants' needs?
- Are the staff friendly and communicating openly with you during your visit? Are the staff well informed and answering your questions clearly?

THE ADJUSTMENT TO ADULT DAY SERVICES CAN BE DIFFICULT FOR THOSE WITH ALZHEIMER'S DISEASE OR IN COGNITIVE DECLINE AND MAY EVEN BE MET WITH SOME RESISTANCE.

Making the introduction to an adult day care centre should be a gradual transition, and may require you to visit the centre for an event and/or activity with the participant, and then slowly increase the frequency of the visits as she or he gets more comfortable with some of the familiar faces and the routines.

This process will not only give the participant a greater comfort level with the centre, but also will provide the caregiver with additional opportunities to observe (and continue to evaluate) the centre in full operation.

THE FUTURE OF ADULT DAY SERVICES

The world's older population continues to grow at an unprecedented rate. According to the National Institute on Aging, approximately 8.5% of the world's population in 2015 was comprised of geriatrics (roughly 617 million people), and this figure is estimated to rise to over 1.6 billion by the end of 2050, accounting for nearly 17% of the world's population.

In 2019, the global adult day services market was worth approximately US$842 billion and trends indicate that this is expected to surge approximately 8.5% and surpass US$1,755 billion by 2026.

THE INCREASING DEMAND FOR ADULT DAY SERVICES IS LARGELY DRIVEN BY THE GROWING AGING POPULATION AND THEIR ACCOMPANYING DECLINING HEALTH CONDITIONS, AS WELL AS THE STEADY RISE IN HEALTHCARE COSTS.

EXAMPLES OF ADULT DAY CARE ACTIVITIES

- SOCIAL ACTIVITIES/RECREATION
- MENTAL INTERACTION
- MEALS AND SNACKS
- PHYSICAL, THERAPEUTIC, AND/OR OCCUPATIONAL EXERCISE
- HEALTH-RELATED SERVICES
- SPEECH THERAPY
- MEDICATION MANAGEMENT

Additional challenges for participants or caregivers looking for adult day services will likely include price, accessibility, and resources. While some insurance programs may cover the cost or offer partial reimbursement, some do not support these kinds of programs whatsoever, and therefore all costs incurred may become a personal expense. In addition, the disparity between programs and where they are offered, as well as the ability to find qualified individuals to work at the centres and offer quality care to participants, are growing industry concerns.

While adult day services play a role in decreasing the overall burden on the healthcare system by offsetting and delaying the need for full-time long-term care (which in and of itself is an initial cost-saving alternative for participants and caregivers), one of the most positive impacts of adult day services is the priceless impact that it has by providing support and temporary relief for caregivers when they might need it the most.

A study published in the *American Journal of Geriatric Psychiatry* in 2014 looked at 151 individuals who care for those with dementia. In an eight-day period, the caregivers showed higher levels of DHEA-S (a chemical that helps protect the body against the damaging effects of stress and may reduce the risks of illness) on days after their loved ones spent time in adult day care.

THE RESEARCHERS FOUND THAT REGULAR USE OF SUCH SERVICES ALLOWED CAREGIVERS' BODIES TO MOUNT A PROTECTIVE AND RESTORATIVE RESPONSE TO THE PHYSIOLOGIC DEMANDS OF CAREGIVING.

Researching (and ultimately taking advantage of) the adult day services in your area is well worth the time and effort. The opportunity to engage with others socially in a safe and secure environment, while continuing to nurture cognitive needs with stimulating activities, increases an individual's feeling of independence and helps improve the quality of life for participants and their caregivers. Since an individual's required level of services will evolve over time, the earlier she or he engages in an adult day care environment the better.

Where's the Beef?

BENEFITS OF PROTEIN IN YOUR DIET

Trenton Mackenzie-Armes has always been active and athletic but keeping strong and healthy became more of a challenge as he got older, particularly as he entered his 40s and 50s while working in a fast-paced job that required intense days, long nights, and rushed meals.

Today, at 62 years old, he has changed his lifestyle, making sure that he is not only eating a protein-rich diet but also weightlifting, in order to set himself up as best as he can for his golden years.

"It's amazing what happens to us – it happens so slowly, you can see it creep up on people," he said. "In your early 60s, you really need to go out of your way to start to build those good habits. My dad's 85 and he's rapidly losing mobility. People don't notice it until it's too late and I don't think I can change him. It will take a crisis where he can't get out of his chair."

Olivera Stojanovic was in her 20s when she decided that she wanted to take control of her health by learning more about fitness, the exercises that would keep her strong, and the food that would fuel her success.

She too was motivated by watching her eastern-European relatives grow older and increasingly frail with a cultural diet that consisted primarily of high-fat and high-salt foods.

Today in her 40s, Stojanovic believes that a proper diet is the key to healthy aging.

"Protein was previously viewed as a bodybuilder's diet, but now it's more widely accepted as the norm for a healthy lifestyle," she said. "I have seen family members become frail because of the way they were eating. I knew that aging didn't have to look like that or be like that. Being older can look different and that is my life's mantra."

> *I believe a good diet that includes a lot of protein, in combination with working out, is the only true key to anti-aging. I'm convinced there's no cream or product you can buy that can compare or have the same impact.*

Stojanovic and Mackenzie-Armes are just two examples of how Canadians, both women and men, are increasingly becoming more health conscious about the foods that they consume and the impact that their diet will have on their lifestyle as they become older.

A recent survey conducted in March and April 2022 by Ipsos-Reid, entitled "A Profile of Canada's Eating and Food Purchasing Habits," found that the vast majority of respondents (73%) claimed to eat a well-balanced, healthy diet. Additionally, similar to previous research, younger Canadians between the ages of 18 and 34 had less healthy diets compared to those over the age of 55.

When it came to protein intake, while almost half of respondents (46%) said that they were trying to increase their intake of red meat, it was younger Canadians (51%) who were actively trying to consume more of it.

Researchers have noted, though, that it is the older generation that needs to be the most concerned about consuming enough protein in their diet, as it can help prevent or stave off sarcopenia (the loss of muscle tissue due to age-related changes to body composition, strength, and function). Sarcopenia can cause frailty, frequent falls, and fractures.

Several studies have identified protein as a key nutrient for elderly adults. A review conducted by Dr. Jamie I. Baum and colleagues – published in the June 2016 issue of *Nutrients* – concluded that "protein intake greater than the recommended amounts may improve muscle health, prevent sarcopenia, and help maintain energy balance, weight management, and cardiovascular function. Benefits of increased protein intake include improved muscle function and the prevention onset of chronic diseases, which can increase quality of life in healthy elderly adults."

CANADA'S FOOD GUIDE QUESTIONED ON PROTEIN GUIDELINES

How much protein, though, is enough? Dr. Baum and his colleagues noted that experts in the field of protein and aging recommend a protein intake between 1.2 and 2.0 grams per kilogram of body weight per day or higher for elderly adults – an amount that falls short of the Recommended Dietary Allowance (RDA) of 0.8 grams per kilogram of body weight per day.

It is estimated that approximately 38% of adult men and approximately 41% of adult women have dietary protein intakes below the RDA.

PART OF THE PROBLEM IS THAT THE GUIDELINES THAT HELP INFORM THE PUBLIC AND HEALTHCARE WORKERS USE A "ONE-SIZE-FITS-ALL" APPROACH FOR BOTH YOUNG AND OLDER ADULTS.

In 2018, researchers out of the University of Alberta released their assessment of Canada's Food Guide and the guidelines that inform it. In their literature review (published in the December 2018 issue of *Applied Physiology, Nutrition, and Metabolism*), Dr. Camila Oliveira and colleagues highlighted the latest evidence regarding protein intake and physical activity, and concluded that the current guidelines do not reflect recent knowledge on sarcopenia prevention.

Since the time of their analysis, the guide has been updated to recommend, amongst other things, an intake of more plant-based protein. However, some of the authors of the 2018 →

The Recommended Dietary Allowance (RDA) is the average daily dietary intake level that is sufficient to meet the nutrient requirement of nearly all (97-98%) healthy individuals in a particular life-stage and gender group. The RDA is the goal for usual intake by an individual.

review recently told Mind Over Matter® that the guidelines still fall short of adequately advising older Canadians about their nutritional needs.

Dr. Oliveira, a postdoctoral research fellow in nutrition and metabolism at the University of Alberta, said key issues they identified were not addressed in the updated guide, including that:

- protein recommendations should be specific for distinct population groups (i.e., age, sex, health status, and physical activity levels); and
- protein quality and distribution of intake should be addressed for older adults for the prevention of sarcopenia.

"The revised Canada's Food Guide presents a plate showing that a quarter of the daily food intake should come from protein foods, which does not personalize it for different population groups, including older adults – which is understandable when simplicity is taken into account," she said. "Therefore, the revised food guide also does not personalize protein recommendations for distinct population groups."

Dr. Oliveira noted that an additional resource entitled "Canada's Healthy Eating Pattern" was intended to be published in 2019 with the objective of providing more specific guidance on the recommended amounts and types of foods, as well as life stage guidance (for example, recommendations for young children and seniors).

"To my knowledge, this document has not been published yet, but when released, it has the potential to help healthcare professionals tailor protein intake recommendations for older adults," she said.

Anissa Armet, a PhD candidate, registered dietician, and researcher who works with Dr. Oliveira, noted that the guide's updated recommendation to "choose protein foods that come from plants more often" has advantages but may be problematic for some seniors struggling to meet their daily protein needs.

> **THE MAJORITY OF PLANT-BASED PROTEINS ARE INCOMPLETE PROTEINS.**

Armet continued, "This means they are missing some indispensable amino acids (the building blocks of protein) that we need to get from our diet because our body can't make these amino acids. The exception is soy protein (tofu, tempeh, soy milk), which is the only plant-based protein that contains all of the indispensable amino acids. However, plant-based proteins have a lower anabolic potential, meaning they do not stimulate muscle protein synthesis as much as animal-based proteins."

THE RIGHT KIND OF PROTEIN

While consuming enough protein is important to maintain optimal health and function, not all protein is created equal.

Anissa Armet, a PhD candidate, registered dietitian, and researcher with the University of Alberta, noted that it is important to have both animal-based and plant-based proteins in your diet, particularly from sources that are unsweetened and that are low in fat and salt.

Optimal animal-based proteins include:

- Skinless chicken
- Turkey breast
- Lean cuts of red meat
- Unsweetened, low-fat Greek yogurt
- Eggs
- Unsweetened, low-fat milk
- Fish (such as tuna and salmon)

When it comes to plant-based proteins, Armet said that it is a bit more complicated.

"The majority of plant-based proteins are incomplete proteins. This means they are missing some indispensable amino acids (the building blocks of protein) that we need to get from our diet because our body can't make these amino acids."

However, Armet pointed out that there are some great health benefits that make plant-based proteins an important part of a protein-rich diet.

"Plant-based proteins are often low in fat, do not contain cholesterol, and are high in important nutrients like dietary fibre and potassium," she said.

Soy protein (such as tofu, tempeh, and soy milk) is the only plant-based protein that contains all of the indispensable amino acids. Armet also encourages individuals to incorporate beans, lentils, and chickpeas in their diet.

"There is currently not enough evidence to suggest that women would need different types or amounts of protein based on their menstrual cycle or if they are postmenopausal or not," she said. "What we do have evidence to support is that when a woman is 65 or older, her protein requirements increase to 1.2 to 1.5 grams of protein per kilogram of body weight."

"With careful planning and working with a registered dietitian, it is possible for older adults to meet protein needs if they choose to only eat plant-based proteins. Otherwise, we would recommend eating a variety of both lean animal-based proteins and plant-based proteins to meet protein needs and prevent sarcopenia."

A popular and easy method to increase protein intake is through protein shakes and supplements, but Dr. Oliveira warns that these are not an ideal substitute for the quality protein individuals receive from consuming unprocessed food.

"Overall, protein supplements should not substitute food, but they can help increase protein intake if people struggle to meet their needs through diet alone. However, before starting on a protein supplement, I would encourage the individual to see a registered dietitian and try to adjust the diet to increase its protein content. Food first, always!"

PHYSIOLOGICAL CHANGES, HEALTH & INFLATION PUT SENIORS' NUTRITION AT RISK

Meeting the daily protein recommendations can be difficult, even for younger, healthy Canadians like Olivera Stojanovic and Trenton Mackenzie-Armes.

Stojanovic said that she relies on protein shakes to give her intake a boost on busy days where her diet is lacking.

Despite his best efforts to have protein at every meal, Mackenzie-Armes noted that his trainers at the gym insist that he requires more than he is consuming. "I find it hard to hit that daily intake. I usually succeed four out of seven days," he said. "The last five or six years, I've drilled down even more to choose better and more protein. I'm not quite weighing my food but probably should be to get more energy."

He has been trying to reduce the amount of red meat that he eats, but still balances his diet each week with lean cuts of beef, chicken, and fish, as well as plant-based proteins.

Dr. Chris Frank, former President of the Canadian Geriatrics Society and a Professor in the Department of Medicine at Queen's University in Kingston, Ontario, advised that it is important to establish good nutritional habits early on because it becomes even more challenging to do so as you age, particularly for those older adults who are dealing with health conditions, reduced appetite, hospital stays, and a lack of support and/or resources.

Then there is the issue of balancing protein for elderly individuals suffering from kidney disease, he said, as too much animal protein can have an adverse effect.

Dr. Frank works with geriatric inpatients and believes that hospitals can do more to ensure that seniors in their care are getting adequate nutrition.

"There are a number of things in the hospital contributing to poor intake," he said. "Most food has a certain degree of nutritional values, but there are so many barriers to people eating it. The patients could be eating, but then they need to talk to the physician and their food gets cold or they have a test scheduled at that time and they end up missing a meal."

"Nutrition and exercise are the core of our health, along with social interactions," he continued. "Particularly with those in the hospital, physicians need to do a better job of looking at poor nutrition and protein."

Perhaps the biggest challenge has been the social isolation recently brought on by the response to the COVID-19 pandemic, along with inflation that has driven a steep spike in the price of food.

According to data from the United Nation's Food and Agriculture Organization, global food prices have surged approximately 65% since the beginning of the pandemic in early 2020.

"One of the classic things that affect nutrition, particularly in frailer seniors, is access to food and the supports around food preparation," said Dr. Frank. "Over the course of the pandemic, those that didn't have family when we were all locked down probably had less adequate nutrition. And now, with rising prices, just knowing how close to the bone a lot of people already live, people are living a little bit more of a vulnerable existence, or on more of a fixed income and maybe can't have that proactive interest in nutrition."

NO DIFFERENCES BETWEEN THE SEXES FOR PROTEIN REQUIREMENTS

When it comes to protein intake, there are no dramatic differences between the sexes. While some experts believe that both sexes should have more protein than what is currently outlined in the RDA, there is no concrete evidence to suggest that women should consume more or less protein than their male counterparts.

> **CURRENTLY, THERE IS NO DISTINCTION BETWEEN PROTEIN REQUIREMENTS FOR WOMEN VERSUS MEN. ON A GRAM PER KILOGRAM PER DAY BASIS, ADULT WOMEN AND MEN REQUIRE THE SAME AMOUNT OF PROTEIN (0.8 G/KG/DAY).**

"If a woman or a man is larger, then she or he would need more protein per day. Protein requirements may otherwise differ based on age, health condition, and/or activity levels." ⟶

Furthermore, while women may crave more protein at different points in their menstrual cycle, there does not seem to be a connection between protein intake and an impact on their period.

A recent study conducted by Dr. Serena C. Houghton and colleagues, published in the June 2019 issue of *Public Health Nutrition* and involving women between the ages of 27 and 44 who were premenopausal, examined whether protein intake during the late luteal phase of the menstrual cycle helped develop pre-menstrual syndrome or "PMS" (characterized as physical and emotional symptoms in the first days of a woman's period).

The researchers found that, overall, consuming protein was not associated with PMS nor was it associated with the risk of developing PMS.

"In logistic regression models adjusting for smoking, body mass index, B vitamins, and other factors, total protein intake was not associated with PMS development," the authors of the study explained.

Armet (who was not involved in this particular study) noted that while protein intake may not influence a woman's menstrual cycle, it does have an impact on aging.

TIPS FOR CHALLENGING TIMES

Dr. Frank cautioned that while seniors might be the most vulnerable to the effects of the pandemic and inflation, other members of the general public will also have to navigate this challenge carefully.

"Let's face it, in the North American diet, meat is a fairly common source of protein and so I think the cost of food and even transportation is almost certainly going to put people's general nutrition at risk," he said.

Even for habitually active and successful professionals like Mackenzie-Armes and Stojanovic, the pandemic and rising food prices have taken a toll.

"During the pandemic, I couldn't go to the gym. I tried to work out and when I turned 60, I noticed it was harder to maintain muscle mass," Mackenzie-Armes said. "Time and experience have shown me that paying attention to food composition pays off and so I'm trying to eat more protein to help and to prepare food at home because, inflation aside, the economics of going out to eat is too painful to sustain."

For Stojanovic, not having an outlet to release her stress during the pandemic had an impact on her mental health and consequently on her diet. Now, inflation is another challenge that she needs to navigate.

"It's so much harder to get good quality meat for a reasonable price," she said. "You have to be a really good shopper and constantly be price comparing."

Armet provided a few tips for those struggling to buy protein at the current prices:

- Purchase meat when it is on sale and store it in the freezer for later;
- Purchase eggs, canned fish, and ground meat as they tend to be less expensive choices, as well as canned beans (which are a cheap, nutritious plant-based protein source and easy to prepare); and
- Make healthy and cost-effective substitutions to recipes – for example, replace sour cream with Greek yogurt, include cottage cheese in your smoothies, and add cracked eggs to stir-fries.

Just as importantly, Dr. Oliveira noted that social interaction remains a critical component of improved nutrition.

"The COVID-19 pandemic brought more social isolation to all of us, which negatively impacts appetite and hence nutritional status," she said. "This is even more concerning for older adults, considering that social isolation was already a reality for them before the pandemic and now it became worse. Recognizing the nutritional impact of social interaction during mealtimes, the revised Canada's Food Guide recommends that seniors eat meals with others."

Mackenzie-Armes added that the most important piece of advice that he has ever received is to find balance and have fun with food.

"No one is going to eat properly if they can't find joy in it."

Gordon Mackie's Apple Pie

SERVES 8 | 45 MINUTES

INGREDIENTS

PIE CRUST

+ 2 1/2 cups flour
+ 1 teaspoon salt
+ 1/2 cup of cubed butter
+ 3/4 cup cold water

PIE FILLING

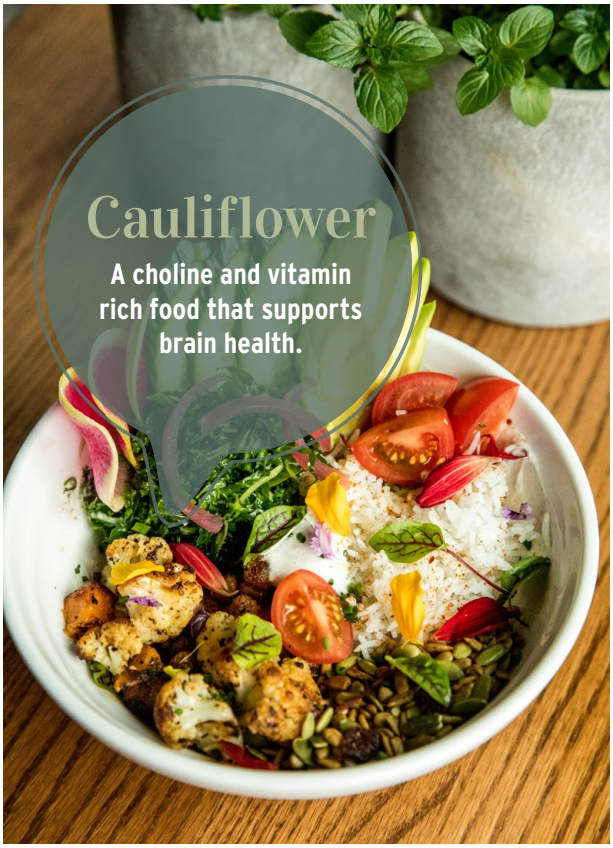
+ 2 1/2 lbs apple peeled and sliced
+ 1 lemon zest and juice
+ 2 teaspooons cornstarch
+ 1/2 teaspoon salt
+ 2 tablespoons white sugar
+ 1 1/2 teaspoons cinnamon
+ 1 egg beaten

Apple

Natural compounds found in apples help to stimulate the production of new brain cells.

INSTRUCTIONS

1. In a medium-sized bowl, add the flour and salt. Mix with fork until combined.
2. Add in cubed butter and break up into flour with a fork. Mixture will still have lumps about the size of small peas.
3. Gradually add the ice water and continue to mix until the dough starts to come together. You may not need all of the water, but if the dough is too dry then add more. The dough should not be very tacky or sticky.
4. Work the dough together with your hands and turn out onto a surface. Work into a ball and cover with cling wrap. Refrigerate.
5. Peel the apples, then core and slice.
6. In a bowl, add the sliced apples, add one lemon zest and juice, add the cornstarch, salt, 1 tablespoon of white sugar, and 1 teaspoon of cinnamon.
7. Mix until combined and all apples are coated. Refrigerate.
8. Preheat the oven to 375°F (200°C).
9. On a floured surface, cut the pie dough in half and roll out both halves until round and about 1/8-inch (3 mm) thick.
10. Roll the dough around the rolling pin and unroll onto a pie dish making sure the dough reaches all edges. Trim extra if necessary.
11. Pour in apple filling mixture and pat down.
12. Roll the other half of the dough on top.
13. Trim the extra dough from the edges and pinch the edges to create a crimp. Make sure edges are sealed together.
14. Brush the pie with the beaten egg and sprinkle with the 1 remaining tablespoon of sugar and 1/2 teaspoon of cinnamon.
15. Cut four slits in the top of the pie to create a vent.
16. Bake pie for 50-60 minutes or until the crust is golden brown and no greyish or undercooked pastry remains.
17. Allow to cool completely before slicing.
18. Top with ice cream and serve.
19. Enjoy!



Harvest bowl

SERVES 8 | 30 MINUTES

INGREDIENTS

- 4 cups roasted vegetables
- 4 cups basmati rice
- 4 cups shredded kale
- 4 tablespoons honey Dijon dressing
- 1/4 cup nut and seed salad topper
- 1 whole avocado quartered
- 4 Campari tomato quarters
- 1 cup cilantro lime raita
- 2 tablespoons zatar spice

ROASTED VEGETABLES

- 1 medium sweet potato cut into 1/2" dice
- 1 cup of cauliflower florets
- 1 tin of chick peas drain and rinse
- 1 tablespoon of extra virgin olive oil
- 1/2 teaspoon of salt

BASMATI RICE

- 2 cups of uncooked basmati rice
- 3 cups of water
- 1 1/2 teaspoons salt
- 1 cinnamon stick

CILANTRO LIME RAITA

- 1 cup of whole milk plain yogurt
- 1/4 cup grated cucumber
- 1/2 teaspoon cumin
- 2 teaspoons lime juice
- 2 tablespoons chopped cilantro
- 1/4 teaspoon salt
- 1/4 teaspoon black pepper

HONEY DIJON DRESSING

- Small shallot peeled and finely chopped
- 2 tablespoons red-wine vinegar
- 1 tablespoon Dijon mustard
- 1 tablespoon honey
- 1/4 cup of extra virgin olive oil
- Salt and pepper to taste

INSTRUCTIONS

1. Place a cup of warm rice in the bottom left side of the bowl.
2. Spoon a cup of the warm roasted harvest vegetable tossed in 1 tablespoon of the honey Dijon dressing.
3. Place shredded kale in a medium-size bowl and dress the kale with the honey Dijon dressing.
4. Place at the top between the roasted harvest vegetables and the basmati rice.
5. Pour 1/4 cup of the cilantro lime dressing in the middle.
6. Add 1/4 of avocado in between the rice and the roasted vegetable.
7. Add the Campari tomato quarters in between the roasted vegetable and shredded kale salad.
8. Sprinkle the seed and nut salad topper over the kale.
9. Sprinkle the zatar seasoning over the basmati rice and serve.
10. Enjoy!

ROASTED VEGETABLES

1. Take the sweet potato dice, chick peas, and cauliflower florets and place in a medium-size bowl and toss them in extra virgin olive oil and salt.
2. Preheat oven to 400°F (200°C).
3. Spread vegetable on a baking tray and bake for 8-10 minutes until vegetables are golden brown.

BASMATI RICE

1. Rinse rice, water, salt, and cinnamon stick in a medium-size saucepan over medium heat.
2. Bring to simmer then place a tight-fitting lid and turn down heat.
3. Cook for 12 minutes.
4. Remove from heat and leave for 5- 10 minutes with lid on and then fluff with a fork for fluffy rice.

CILANTRO LIME RAITA

1. In a medium-size bowl grate the cucumber and add yogurt, cumin, lime juice, and chopped cilantro.
2. Season with salt and pepper to taste.

HONEY DIJON DRESSING

1. Finely chop shallot in medium-size bowl.
2. Add the red wine vinegar, Dijon mustard, and honey.
3. Slowly wisk in extra virgin olive oil until incorporated.
4. Season with salt and pepper to taste.

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