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Mind Over Matter®

VOLUME 14

HELPING YOU PROTECT YOUR BRAIN HEALTH

Laughing Your Way To BETTER BRAIN HEALTH

Ensuring Research *Equity*

Recognition FOR THE INITIATIVE

Indigenous Cognitive ASSESSMENT

Trusted Contact Person

Gender *Differences* & CHRONIC STRESS

Women's Brain Health Initiative


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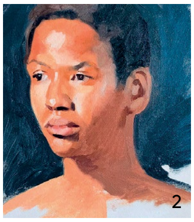
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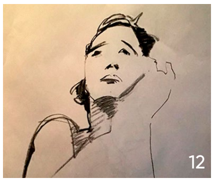
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We're All Different and That's Why This Is So Important.

Women are twice as likely to suffer from depression, dementia, and stroke as we age. Yet 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:
1. @EWA_LOOK 2. @GHOLME 3. @SEANADRAWS 4. @JESSICA_A_MCVICKER_ART 5. @JAMESMCMULLANART
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Women's Brain Health Initiative

Fondation Brain Canada Foundation

Editor's Letter

Women's Brain Health Initiative (WBHI) is celebrating an exciting milestone in 2022: our tenth anniversary. As I reflect on our first decade, I am filled with gratitude to the many friends and donors who have helped WBHI grow from the seed of an idea into an important, trusted voice across the globe for women's brain health. Together, we have broadened an essential conversation about aging, dementia, and research equity.

WBHI has contributed to a profound shift in scientific thinking. Diseases like dementia do not affect the sexes equally, so research must explore the differences between women and men. Fortunately, things are changing. Through efforts like ours, an ever-increasing number of people are now recognizing that dementia need not be inevitable; rather, we can make certain lifestyle choices to help protect and preserve our cognitive vitality.

In this edition of Mind Over Matter®, I invite you to read an article detailing how WBHI is helping to fund Canadian-based researchers who are deepening our understanding of sex and gender differences. Working with our valued partner, Brain Canada, we are supporting people like Dr. Mario Masellis who is leading a prestigious international project that aspires to improve our diagnosis of dementia, and the extraordinary Dr. Gillian Einstein and her colleagues, who are expanding the boundaries of sex and gender work with their study into how long-term hormone therapy affects the cognition of trans women.

In a time when Canada is engaging in a profound national conversation on reconciliation, I hope you will appreciate some of the exciting programs, research, and cultural nuances presented within this issue of Mind Over Matter®.

We are also thrilled to share some big news about Mind Over Matter® - the centrepiece of our educational outreach. Thanks to a grant from the Public Health Agency of Canada (PHAC), we have launched a new podcast and video series, and soon a mobile app, which will help us spread the brain health message through new media platforms. I hope you will check them out and let us know what you think.

Each of these new initiatives build on the success of the magazine. This is the 14th edition of Mind Over Matter®. It has grown to over 150,000 copies in both English and French, distributed across Canada through many newspapers, and to doctors' waiting rooms from coast to coast, not to mention our digital version, which can be found on the WBHI website. If you have a book club or social group, we have a program to distribute copies of the magazine free of charge, so that you can spark interesting and informative discussions at your next meeting. Keen observers may have noticed that many of WBHI's materials carry a purple hue. It is more specifically amethyst, the semi-precious stone that has been thought for thousands of years to possess a variety of beneficial properties. We chose it as our charity's colour partly for its beauty, and partly for its backstory.

The Hebrew word for amethyst also translates as "dream stone," with some believing that it enhances good sleep - certainly a benefit for brain health. Buddhists use amethyst beads as part of their meditation practices - which, like other mindfulness techniques, help reduce stress and anxiety, and correspondingly improve physical and mental well-being.

In honour of our tenth anniversary, WBHI board member and jeweler Mark Lash has created a limited-edition version of the Hope-Knot®, which is adorned with amethysts and can be worn either as a pin or pendant. As the symbol of our charity, the Hope-Knot® is an elegant and lovely evocation of the brain. I hope you will consider purchasing it for yourself and/or a loved one and supporting our work. Mark has even offered to create a personalized version of the Hope-Knot® using the stone of your choice.

It has been an incredible ten years for WBHI. The list of people to thank is long, but I would like to take this opportunity to express our appreciation for Heather Reisman, who helped launch WBHI by providing essential advice and hosting our first fundraiser in her home, and who remains a valued friend, mentor, and supporter.

As WBHI enters our second decade, it is encouraging to know that our work is making an impact. With your support, we can keep moving forward with the same sense of urgency, seeking better answers for women and for all those we love and want to protect.

I wish you happiness and good health.

Lynn

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

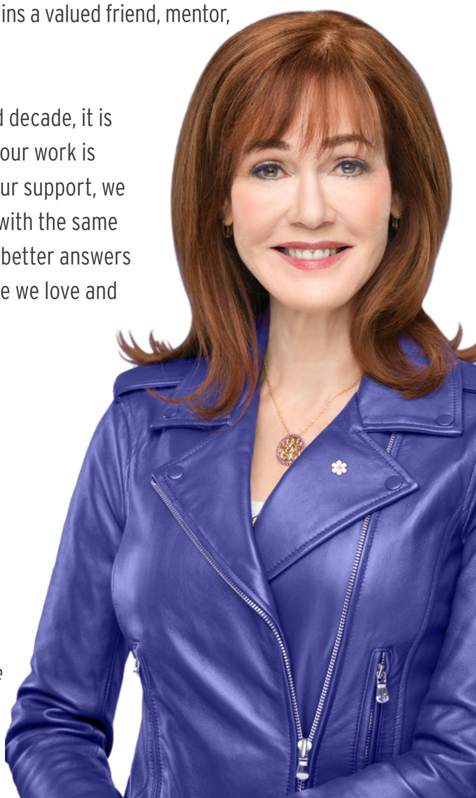

PHOTO: JAYLYN TODD

THINK ABOUT IT

HELPFUL THINKING

BETTER THINKING

LOOKING FOR MORE COPIES?

mom@womensbrainhealth.org

Contributors

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."

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."

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.

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 Canada, the U.S., and the U.K.

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."

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.

COVER PHOTO: JAYLYN TODD

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.

KAYUULA AND SHINA NOVALINGA //
ON THE COVER

Sharing the cover of Mind Over Matter® with her mother Kayuula was already a special opportunity for Shina Novalinga. Being able to show the world their traditional facial tattoos brought it to another, more profound level. The mother-daughter duo are from the small Inuit community of Puvirnituq, Nunavik, in northern Quebec. Shina, a model and social activist, has developed a large following on social media with her postings on Inuit cultural practices, most of which she learned from Kayuula, who appears in many of her videos. They only recently got their facial tattoos, a tradition with great significance among the Inuit. "We're proud to showcase the beauty of our culture," said Shina.

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Brain Canada
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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.

Stressed Out

DOES SEX MAKE A DIFFERENCE?

Stress is a normal response to situational pressures or demands, especially if they are perceived as threatening or dangerous. Our bodies are hard-wired to react to stress in ways that are meant to protect us from predators and other aggressors. Although such threats are rare today, that does not mean that life is free of stress. On the contrary, stress is commonplace in modern life.

Typical sources of stress include a person's physical environment (e.g., noisy streets or an unsafe living space), work, relationships, and major life changes (e.g., experiencing financial difficulties, falling ill, or caring for a sick loved one). While stress can be brief and even a motivating force, if experienced over an extended period of time it can become chronic stress, which adversely impacts our overall health and well-being.

CHRONIC STRESS

Chronic stress is defined as a stressor that is "long-term, something that persists days, weeks, and even years," explained Dr. Tracey Shors, Distinguished Professor in Behavioral and Systems Neuroscience at Rutgers University and the author of the 2021 book entitled *Everyday Trauma: Remapping the Brain's Response to Stress, Anxiety, and Painful Memories for a Better Life.*

> ***A chronic stressor is, in addition to being persistent, unpredictable and uncertain. Part of the stress comes from not knowing what's going to happen in the future.***

A chronic stressor can have physical, chemical, environmental, and/or psychological roots, but "the basic definition is the physiological response to these with the production of a stress hormone called cortisol," added Dr. Jill M. Goldstein, Professor of Psychiatry and Medicine at Harvard Medical School and Founder and Executive Director of the Innovation Center on Sex Differences in Medicine at Massachusetts General Hospital.

Cortisol is created via a pathway in the brain called the "hypothalamic-pituitary-adrenal axis" (or the HPA axis) and this axis in the brain is what regulates how we respond to stress.

Some acute (or short-term) stress can help us make necessary changes, learn something new, or, in the case of exercise, create stronger muscles, heart, and brain function. However, when stress is negative and chronic, it is problematic. "It affects every chronic disease we know," said Dr. Goldstein, including psychiatric and neurological conditions. ⟶

SEX DIFFERENCES

Women and men both experience chronic stress, but the impact of it can differ in the way that it presents itself behaviourally, in the onset of particular diseases, or how resilient individuals are to its effects. Over the last 30 years, researchers have begun to examine how the differences in women's and men's brains affect long-term brain health outcomes, including anxiety and depression (which women are twice as likely to be diagnosed with during the lifespan), and dementia and Alzheimer's disease (where two-thirds of those with Alzheimer's are female).

> **WHILE WOMEN'S AND MEN'S BRAINS ARE LARGELY SIMILAR IN COMPOSITION, RESEARCHERS HAVE FOUND THAT THE SMALL DIFFERENCES IN HOW THE BRAIN DEVELOPS AND FUNCTIONS COULD BE CONTRIBUTING TO WHY WOMEN ARE MORE SUSCEPTIBLE.**

Brain regions such as the hypothalamus and the amygdala – which are activated during chronic stress – are highly sexually dimorphic, and "these brain regions develop differently in the male and female brain and, in part, function differently across our lifespan," explained Dr. Goldstein. "These modest differences are associated with substantial disease risk differences," and getting to the crux of why this occurs is part of the reason Dr. Goldstein founded the Innovation Center on Sex Differences in Medicine.

One avenue of research that is beginning to gain traction is how individuals respond to chronic negative stress and how women and men respond differently. In January of 2021, Dr. Goldstein and her colleagues published a call-to-arms article in *JAMA Psychiatry* that stressed the importance of studying sex differences in brain and heart diseases (including depression and Alzheimer's disease) that co-occur frequently and for which women are at higher risk. In fact, the origins of these co-occurrences and the sex differences therein may begin in prenatal development.

In a recent study published by Dr. Goldstein and her colleagues in the April 2021 issue of *Proceedings of the National Academy of Sciences of the United States of America*, the researchers found that maternal prenatal negative stress was significantly associated with sex differences in the offspring's response to negative stress over 40 years later, with women affected more severely, regardless of diagnosis.

What else is currently known about how chronic stress affects the brains of women and men differently? Like most things to do with our intricate bodies, the answer is not simple. "There is no one factor. It's X, Y, Z, and a few other things," said Dr. Shors. Hormones do play a part.

> **WE KNOW THAT MANY OF THE STRESS-RELATED MENTAL CONDITIONS – LIKE DEPRESSION, ANXIETY, AND POST-TRAUMATIC STRESS DISORDER – ARISE AS WOMEN START TO MENSTRUATE.**

We also know that the reduction of certain hormones like estradiol (the primary form of estrogen that works in the brain) during menopause sometimes has "implications for our memory performance," said Dr. Goldstein.

Chronic stress can impact brain function and structure over the course of our lifespan. The regions in the brain that regulate stress are some of the same regions that are involved in our immune and cardiovascular systems implicated in chronic diseases. Also, some of the same HPA axis regions regulate the release of our sex hormones (estrogens, progesterone, and testosterone). So, chronic stress affects hormonal, immune, and cardiovascular regulation.

Having a better understanding of these relationships will help researchers determine why chronic stress affects diseases of the brain and heart. In the future, the goal is to develop "sex-dependent therapeutics," said Dr. Goldstein – whether that is pharmaceuticals, devices, and/or programs of action – that will be sensitive to the specific health concerns of women and men across the lifespan.

Beyond hormones, the negative effects of chronic stress (like depression and anxiety) are likely more detrimental for women than men due, in part, to the way that "women experience society," noted Dr. Shors. Women historically (and still today) have less control, whether it is over their own safety, housing, or finances. One in three women experience physical or sexual abuse. What's more, women tend to ruminate more than men.

> ***Women tend to have repetitive, often negative, thoughts about what happened in the past or wishing things had been different.***

Part of the reason Dr. Shors wrote her book was to educate people – especially women – that our brains are creating these thoughts, images, and memories. "I think people think their thoughts are these passive, supernatural events, but they're not. They're created by your brain," explained Dr. Shors. These repetitive, negative thoughts can contribute to the prevalence of mental illness and actually change the brain.

In one study of rumination (i.e., the process of continuously thinking about the same idea, event, or situation) conducted by Dr. Rebecca

Cooney and colleagues, published in the December 2010 issue of *Cognitive, Affective, & Behavioral Neuroscience*, the researchers used functional magnetic resonance imaging (fMRI) scans in depressed and healthy individuals and gave them a ruminative task to perform. The depressed participants exhibited more activity in neural regions that are overactive in depression during the rumination task, suggesting that the brain does change through certain patterns of thinking. Social and behavioural factors, along with the biological differences previously noted, make women more vulnerable to particular forms of mental illness and brain diseases.

Readers of Mind Over Matter® will know that dementia and Alzheimer's disease (AD) are complex issues, and that AD is a biological disease process that has a "specific profile under the microscope, the neurofibrillary plagues and tangles tau," said Dr. Shors.

> **WHILE RESEARCHERS HAVE NOT YET ESTABLISHED THE CAUSES OF AD, WE DO KNOW THAT THERE ARE MANY RISK FACTORS – SEX BEING ONE OF THEM.**

There are also several hypotheses regarding the origin of AD, from one's genes to quality of social interaction and certain other lifestyle factors.

One group of researchers have hypothesized that the different biochemical responses to stress between women and men may contribute to the sex disparity in AD prevalence (this hypothesis was published in the February 2018 issue of *Neurobiology of Stress*). Dr. Hongxin Dong, Professor of Psychiatry and Behavioral Sciences and Neurology at Northwestern University's Feinberg School of Medicine, and one of the co-authors of the paper, noted that "stress, anxiety, depression, and AD may have some intrinsic link," and while hormones play a role, more research is needed to determine the exact mechanisms. Future study needs to focus on how to treat traumatic injuries early, for example, to curtail prolonged chronic stress responses in the brain and body.

WHAT YOU CAN DO TO COUNTER CHRONIC STRESS

No matter where you are in your life journey, research shows that taking action as soon as you can – especially in your forties and fifties – can improve brain health outcomes. Cardiovascular disease, diabetes, and depression, for example, are all major risk factors for AD. They can, in part, be modifiable with "diet, mindfulness strategies, psychological and pharmacological therapies, and exercise," said Dr. Goldstein.

> **PHYSICAL EXERCISE, AS WELL AS BRAIN TRAINING AND ACTIVITY, CAN ALSO CURTAIL NEGATIVE BRAIN OUTCOMES AND ENGAGING IN THESE ACTIVITIES EARLY IS CRITICAL.**

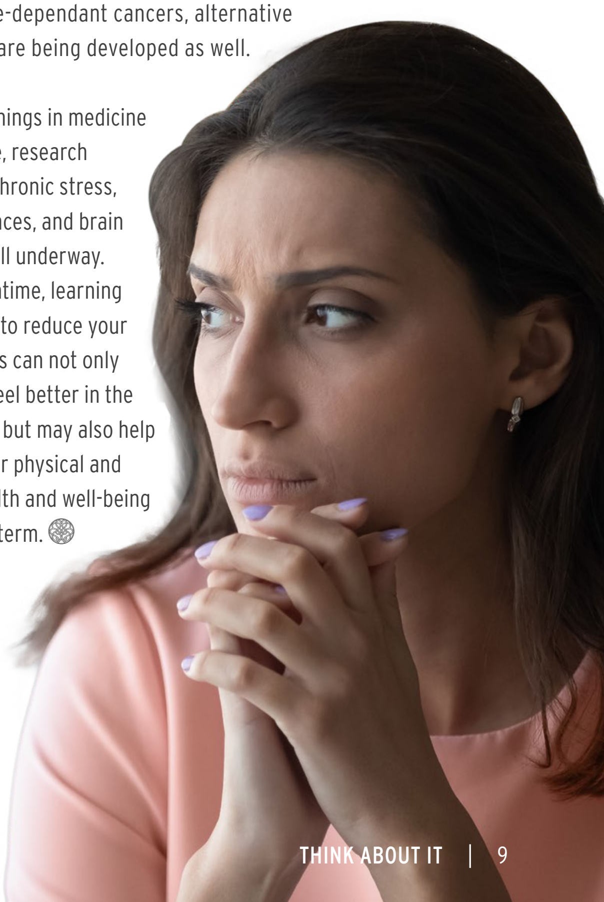
"I've been adamant about training your brain for the future," said Dr. Shors. To help do so, she developed a clinical intervention called "MAP Training" (or Mental and Physical Training), which combines mental training of the brain with physical training of the body. A number of studies conducted by Dr. Shors and her colleagues have demonstrated that individuals who engage in meditation practice, immediately followed by aerobic exercise, are less depressed, less anxious, and ruminate less.

It is important to keep in mind, though, that consistency and effort are key. "Taking a walk is fine, but it is probably not going to change the brain demonstrably. You need to sweat. A little relaxation is fine, but if you really want to change your brain through mediation, you're going to have to sit down and really work at it," noted Dr. Shors.

Dr. Shors also recommends engaging in what she refers to as "effortful learning." It is important to challenge yourself. "The brain really likes novelty. Learn new things, travel, take courses, meet new people. Work at it."

If you are approaching menopause or are early post-menopause, consider talking to your doctor about hormone replacement therapy (HRT). Although controversial in recent decades, the tide may be turning in favour of HRT during later perimenopause or early post-menopause to help maintain intact memory function (however, research about the timing and duration of HRT is still ongoing, cautioned Dr. Goldstein). While some women may not be good candidates for HRT, due in part to increases in certain kinds of hormone-dependant cancers, alternative strategies are being developed as well.

Like most things in medicine and science, research regarding chronic stress, sex differences, and brain health is still underway. In the meantime, learning techniques to reduce your stress levels can not only make you feel better in the short term, but may also help protect your physical and mental health and well-being in the long term.



Striking a Chord

MUSIC-MAKING CAN PROTECT YOUR BRAIN AS YOU AGE

Music can boost brain health and function in a variety of ways. Research has linked music with improved quality of life, enhanced cognitive function, reduced stress, lower risk of dementia, and more. In the last issue of Mind Over Matter®, we examined the many brain benefits of listening to music. In this article, we look at the research on music-making, with a particular focus on the long-term effects of playing a musical instrument.

MUSIC-MAKING PROVIDES BRAIN BENEFITS, REGARDLESS OF AGE

Musical practice (i.e., musical training and performance) is one of the activities that is considered to contribute to cognitive reserve. Playing a musical instrument involves multiple sensory and motor systems and requires a wide variety of higher-level cognitive processes. Studies have shown that children who receive musical training may enjoy cognitive advantages in the near-term (i.e., while they are still children), and that these cognitive advantages can continue into older age.

> **LEARNING TO PLAY A MUSICAL INSTRUMENT WHEN YOU ARE YOUNG BENEFITS YOUR COGNITIVE FUNCTION IN MANY WAYS AS YOU AGE, INCLUDING PROTECTING AGAINST MEMORY LOSS AND COGNITIVE DECLINE, EVEN IF YOU DO NOT CONTINUE MAKING MUSIC INTO ADULTHOOD.**

And, if you missed out on childhood music lessons, it is not too late to reap the benefits of music-making for your brain. Learning to play an instrument in adolescence or adulthood provides cognitive benefits, too.

A meta-analysis of 13 studies – conducted by Rafael Román-Caballero and colleagues and published in 2018 in *PLOS ONE* – examined the benefits of musical practice among cognitively normal participants aged 59 and older. Overall, the collective evidence suggested an association between musical practice and better cognitive functioning in older age. Notably, these benefits were experienced by individuals who engaged in long-term music-making throughout their lives, as well as by individuals who had participated in short music training programs in later life.

Episodic memory is a type of long-term memory that involves conscious recall of previous experiences from your personal past. It is often assessed in studies of cognitive aging as it is commonly compromised in people with Alzheimer's disease and other related dementias.

"The results we observed in older musicians were quite broad and covered a wide array of cognitive functions. And the findings suggested a transfer effect. That means that improvements in certain functions appear to have a positive influence on other functions that were not directly trained. For example, improvements in auditory processing don't just help with musical abilities but apply to speech processing as well," said Mr. Román-Caballero, a PhD candidate at the University of Granada in Spain.

"That makes music training unique as a cognitive training tool. Many cognitive training programs have experienced difficulty →

BrainAGE (Brain Age Gap Estimation) is a widely applied method for evaluating individual brain age based on structural magnetic resonance imaging (MRI). The MRI data is used to quantify acceleration or deceleration of an individual's brain aging, relative to established reference curves for healthy brain maturation throughout the lifespan.

BrainAGE is a well-validated measure that has been shown to outperform biomarkers from cerebrospinal fluid in predicting progression of mild cognitive impairment to Alzheimer's disease.

obtaining results beyond improvements in just the tasks that were directly trained in the program."

A more recent study, conducted by Dr. Jamie Romeiser and colleagues, looked at the association between musical instrument engagement at different stages of life - in adolescence and/or adulthood - and episodic memory in late life. The researchers analyzed 60 years of data from the Wisconsin Longitudinal Study, which had collected survey data from more than 10,000 participants multiple times since 1957.

In particular, the researchers ascertained the participants' musical instrument engagement in high school, categorizing participants into three groups: no musical participation, moderate participation, or high participation. Musical engagement in adulthood was assessed as well, through surveys completed by participants at ages 35, 55, and 65.

Those who reported engaging in music-making at all three time periods were assigned to the "continuous play" group, while those who reported instrument engagement at one point or another were assigned to the "intermittent play" group. Anyone who reported no musical instrument engagement at any of the three points was categorized in the "no play" group. In addition, nearly 6,000 of the participants completed assessments of their episodic memory when they were approximately 65 and 72 years old, using immediate and delayed recall tasks.

> **THE RESEARCHERS FOUND THAT HIGH INVOLVEMENT IN MUSIC-MAKING DURING HIGH SCHOOL AND CONTINUOUS MUSIC-MAKING IN ADULTHOOD WERE EACH INDEPENDENTLY ASSOCIATED WITH HIGHER MEMORY SCORES AT THE AGE OF 65, AFTER ADJUSTING FOR ANY POTENTIALLY CONFOUNDING VARIABLES.**

An examination of memory decline from age 65 to 72 revealed that the benefits of high-school music exposure decreased over time, although those participants categorized in the "high-participation" group still had significantly higher memory scores at the age of 72 compared to the "no-participation" group. These findings were published in June 2021 in *PLOS ONE*.

"Our study suggests there may not be a critical period of time for learning to play an instrument to experience cognitive benefit. Yes, childhood may be an important period for reaping brain benefits of music-making. However, we found that engaging in music-making in adulthood was associated with a protective effect for episodic memory, regardless of whether a participant was engaged in music-making in [her or his] youth or not," explained Dr. Romeiser, a biostatistician and a member of the voluntary faculty at Stony Brook University in the U.S.

> “
> ***Our study adds to a greater body of evidence that suggests there are late-life benefits from playing music as an adult, even if you never played in childhood.***

LEISURE MUSIC-MAKING MAY BE MORE AGE-PROTECTIVE THAN PROFESSIONAL

A group of researchers in the U.S. and Germany used an interesting approach to investigate the potential age-protecting effect of music-making on the brain. Dr. Lars Rogenmoser and colleagues reviewed brain scans and calculated "BrainAGE" scores for each participant and compared the scores across three groups with differing lifetime doses of music-making activities: professional musicians, amateur musicians, and non-musicians.

A BrainAGE score represents the discrepancy between a person's chronological age and the "age of their brain"; a negative score reflects an age-decelerating brain (namely, a brain that is aging more slowly than what would be expected normally at that chronological age).

All three groups were found to have negative scores as follows: non-musicians -0.48, amateur musicians -4.51, and professional musicians -3.70. Note that compared to non-musicians, musicians (whether professional or amateur) had lower BrainAGE scores, suggesting that music-making had a positive effect on slowing aging of the brain.

> YOU MIGHT HAVE EXPECTED THAT SINCE MUSIC-MAKING HELPS PROTECT THE BRAIN FROM AGING, MORE MUSIC-MAKING WOULD BE BETTER. YET, THE AMATEUR MUSICIANS HAD LOWER SCORES THAN THE PROFESSIONAL MUSICIANS, INDICATING A STRONGER AGE-PROTECTIVE EFFECT FOR THE AMATEURS.

These results were published in January 2018 in *Brain Structure & Function*.

"Our findings indicate that music-making overall is associated with age-protective effects for the brain, although more so when it is done as a leisure or extracurricular activity rather than as a main profession. It appears that the beneficial effects of music-making on the brain may not infinitely increase with the intensity of practice," said Dr. Rogenmoser, currently at the University of Fribourg in Switzerland.

"Why would amateur music-making be more protective than professional music-making? Perhaps amateur musicians benefit from participating in a variety of leisure activities, rather than intensely focusing heavily on just one activity. Or, it's possible that professional music-making has stress-related impacts that somewhat diminish the otherwise positive effect of music-making. However, more research is needed before any conclusions can be drawn about the 'why' of our interesting discovery."

THE BRAINS OF MUSICIANS AND NON-MUSICIANS DIFFER

If you think about the complexity of music-making, it is probably not surprising that it has been linked with a myriad of cognitive benefits. Music-making requires intricate coordination and concentrated attention. It involves motor and cognitive functions simultaneously, while also engaging the senses and evoking emotion. It combines skills in auditory and visual perception, pattern recognition, kinesthetic control, and memory. There is a lot occurring when playing an instrument, and brain scan research has shown that the physical brain itself can change for the better in response.

For example, studies have found that musicians tend to have larger amounts of grey matter volume in certain areas, including the auditory, motor, and visuospatial brain regions, as well as enhancements in white matter volume. Additionally, musicians consistently have been found to have a larger corpus callosum, a major tract of fiber that connects the left and right hemispheres of the brain.

GIVE MUSIC-MAKING A TRY

There are numerous ways that you can integrate music-making into your life as an adult, even if you did not play in your youth. The following are some ideas:

- Grab a pot from the kitchen or buy a drum and participate in a drum circle or class (Remo offers a free online drum circle each week: https://remo.com/experience/post/online-weekly-community-drum-circle).
- Look for a music teacher near you or online who offers individual music lessons for adults.
- Check out YouTube – several generous musically-gifted people are sharing what they know to help others learn to play a wide range of instruments for free.
- Join a musical group. Group music-making infuses the experience with the benefits of social connection, one of the "six pillars" of brain health. (Of course, music-making alone or in a group provides mental stimulation, another of the six pillars.) Most communities have a choir you could join, and many have instrumental musical groups as well. For example:
  - The New Horizons Band Guelph (www.nhbguelph.com) is a not-for-profit organization that provides various music-making opportunities for adults in and around Guelph, Ontario, including concert bands, brass and woodwind ensembles, funk-bucket groups, swing bands, and jazz improvisation groups. They have continued to offer programming during the pandemic via Zoom.
  - School of Rock (www.schoolofrock.com) is a company with locations around that world that offer a program for adults with or without previous musical experience. Participants form musical groups and receive private lessons, as well as practice together each week, eventually giving a live performance.

Laugh Out Loud

LAUGHING YOUR WAY TO BETTER HEALTH

Laughter is universal. If someone who does not speak the same language as you laughs, you understand exactly what it is and what it means. It is a rich, nonverbal vocalization that develops in infants before speech. Babies as young as three months old laugh. Interestingly, even children who are unable to hear due to congenital deafness laugh while playing. Although laughter is sometimes used in a negative way (e.g., to tease or taunt someone), it is most often a sign of joy and amusement.

The belief that laughter is good medicine has been around for centuries. Ancient Greek physicians used to prescribe a visit to the "hall of comedians" as part of their healing process. In the 14th century, a French surgeon used humour during surgery to help distract his patients from pain, as well as after surgery to help with recovery. Other health professionals, in the 16th century, began using humour to treat psychiatric conditions.

The word **gelotology** comes from the Greek word "gelos," meaning laughter. In ancient Greek mythology, Gelos was the god of laughter.

Indeed, throughout history, the physical and mental health benefits of humour have been well accepted, but there was little empirical evidence to support this belief until the 20th century, when researchers began investigating the mechanisms underlying the positive effects of humour.

Dr. William Fry was the pioneering researcher who coined the term "gelotology" to describe the scientific study of humour. In 1964, he founded the Institute of Gelotology at Stanford University and began studying the physiological and psychological benefits of laughter.

In this article, we look at some of the interesting findings in the field of gelotology since then, with a focus on positive laughter and its impact on health.

SPONTANEOUS VS. SIMULATED LAUGHTER

When it comes to studying laughter, researchers broadly distinguish between two types of laughter: spontaneous and simulated. Spontaneous laughter is triggered by a humorous stimulus and is often considered a "genuine" laugh, while simulated laughter is intentionally self-induced without the presence of anything humorous and is sometimes called a "fake" laugh.

Laughter has also been studied in two different contexts. **Laughter interventions** are laughter-inducing therapies that are applied deliberately (e.g., a laughter program or session). Then there is **laughing in day-to-day life**. Some laughter interventions involve spontaneous humour-induced laughter, and others involve simulated non-humorous laughter.

Spontaneous laughter interventions typically use humorous videos or clowns to induce laughter, whereas simulated laughter interventions usually include vocalizing laughter-like sounds (such as "haha" and "hehe"), along with clapping and dancing. Some simulated laughter programs include breathing and relaxation exercises as well.

THE HEALTH EFFECTS OF LAUGHTER INTERVENTIONS

A 2019 review and meta-analysis by Dr. Natalie van der Wal and Dr. Robin Ko – published in *Social Science & Medicine* – examined research on spontaneous and simulated laughter interventions conducted with a variety of populations (i.e., people of all ages, including healthy individuals and people with various mental or physical conditions).

The researchers included 86 studies in their systematic review and 20 in their meta-analysis. Overall, they found that most of the studies reported positive results: participants in laughter study groups showed improvements in physical or mental health compared to control groups (who either received care as usual, no intervention at all, or performed a different activity such as watering plants or making crafts).

Improvements reported include decreased depression, pain, and stress hormones, as well as improved mood and life satisfaction. Interestingly, the researchers found that simulated laughter appears to be more effective than spontaneous laughter.

However, according to Dr. van der Wal, an Associate Professor at Delft University of Technology in the Netherlands, the overall study quality was "low, with all included studies having a substantial risk of bias."

> **LAUGHTER-INDUCING THERAPIES DID, HOWEVER, SHOW PROMISE AS A COMPLEMENTARY ADDITION TO MAIN THERAPIES, ESPECIALLY SIMULATED LAUGHTER INTERVENTIONS.**

"What is particularly exciting about laughter interventions is that they are low-cost and suitable for a wide range of individuals. Even people who are confined to a hospital bed with illness can participate. So can individuals with cognitive impairment since no cognition is required for simulated laughter."

THE HEALTH EFFECTS OF LAUGHTER IN DAY-TO-DAY LIFE

Researchers in Japan looked at the associations between frequency of day-to-day laughter and mortality and cardiovascular disease in over 17,000 participants aged 40 years and older over a follow-up period of up to eight years. Participants were asked to self-report how often they laugh out loud.

Low frequency of laughter (defined as laughing less than once a month) was found to be linked with significantly higher rates of all-cause mortality and cardiovascular disease, even after adjusting for age, gender, and multiple well-known risk factors, including smoking, hypertension, and diabetes.

Laughing more often daily may have protective effects for health, contributing to increased longevity and decreased incidence of cardiovascular disease. →

INTERESTING FACTS ABOUT LAUGHING FREQUENCY

- Children laugh far more often than adults, up to 400 times each day (compared to roughly 15 times a day for adults).
- Individuals are approximately 30 times more likely to laugh when they are around others than when they are alone.

The researchers found this to be particularly true for the elderly and people with obesity, as well as individuals experiencing moderate stress levels. These findings were published in April 2020 in *Journal of Epidemiology*.

IS LAUGHTER A FORM OF EXERCISE?

A 2018 study – conducted by Dr. Mikaela Law and colleagues, published in *Complementary Therapies in Medicine* – compared the cardiovascular effects of simulated versus spontaneous laughter. Seventy-two participants were randomly assigned to one of three intervention groups: (1) simulated laughter (who were asked to generate fake laughter); (2) spontaneous laughter (who watched a humorous video); or (3) control (who watched a non-humorous documentary).

Each intervention lasted six minutes and was followed by a laboratory stress test. Throughout the experiment, participants' heart rate and heart rate variability were monitored continuously, using an electrocardiogram (ECG).

> **THE RESEARCHERS FOUND THAT LAUGHTER RESULTED IN INCREASED HEART RATE AND REDUCED HEART RATE VARIABILITY, WHICH ARE CONSISTENT WITH THE EFFECTS OF EXERCISE.**

These effects were more pronounced with simulated laughter versus spontaneous laughter. The participants in the simulated laughter group laughed more intensely than those in the spontaneous laughter group, which may help explain why the simulated laughers experienced more pronounced effects.

BENEFITS OF BEING FUNNY

Research has found that people who are gifted at making others laugh find it easier to attract romantic partners. In one study of adolescents, participants indicated humour was the second-most preferred strength in an ideal partner (after honesty). People who others find funny also tend to make favourable impressions, and are better at navigating potentially challenging social interactions, such as Thanksgiving dinner.

"When you laugh, your heart rate and blood pressure go up, your stomach muscles are engaged, and your breathing changes. These are all things that happen during exercise, too. Knowing these parallels between laughter and exercise led us to hypothesize that laughter would induce exercise-like cardiovascular effects, and we were correct," said Dr. Law, a Research Assistant at the University of Auckland in New Zealand.

> **OUR RESEARCH CONFIRMED THAT LAUGHTER ACTS AS A FORM OF EXERCISE, WITH MORE FREQUENT AND INTENSE LAUGHTER PRODUCING A GREATER EXERCISE EFFECT. WHAT A FUN WAY TO GET IN SOME CARDIO!**

LAUGHTER YOGA: A POPULAR SIMULATED LAUGHTER INTERVENTION

In the mid-1990s, Dr. Madan Kataria developed Laughter Yoga. A typical Laughter Yoga session is done in a group (although it can be done alone as well) and begins with some physical and breathing exercises followed by simulated laughter exercises.

Usually, the fake laughter turns into real laughter quite soon and may continue for 30 minutes or more. Laughter Yoga is very popular and practiced in "laughter clubs" around the world. In his 2018 book, entitled *Laughter Yoga: Daily Practices for Health and Happiness*, Dr. Kataria claims that Laughter Yoga "guarantees benefits for everyone, even those who are serious or introverted" and notes that the "benefits can be felt from the very first session."

A review conducted by Dr. Nilgün Kuru Alici and Dr. Ayse Arikan Dönmez looked at the research from May 2010 to May 2020 on the effects of Laughter Yoga on physical function and psychosocial outcomes in older adults. Seven studies were included in the review, which was published in October 2020 in *Complementary Therapies in Clinical Practice*.

> *Laughter Yoga was linked with significant positive differences in the older adults' physical function (blood pressure, cortisol level, and sleep quality), as well as in their psychosocial health (life satisfaction, quality of life, loneliness, death anxiety, depression, mood, and happiness).*

Based on their review of the evidence, they concluded that Laughter Yoga is a cost-effective intervention with no adverse effects that is well-suited for health promotion in older adults.

TIPS FOR LAUGHING MORE

Although research on laughter has been underway for decades, the field of gelotology is really in its infancy and there is still much to learn about the physiological and psychological effects of laughter, the ideal "dosage," and the mechanisms that underlie the benefits.

Although more research is needed to build a stronger evidence base for laughter as "medicine," virtually all studies of laughter's impact on health to date indicate positive results, and there are almost no negative side effects. So, for the sake of your health, go ahead and take proactive steps to laugh more.

Here are three tips to help you integrate more laughter into your life:

1. CREATE CONDITIONS AND SEEK MORE SITUATIONS THAT YOU FIND HUMOROUS TO INCREASE THE LIKELIHOOD THAT YOU WILL SPONTANEOUSLY LAUGH.

- Choose a comedy when you watch a television show or movie or go to see a play.
- Choose funny greeting cards to send to people.
- Read jokes.
- Look for silly videos online.
- Listen to funny podcasts.
- Go to a comedy club.
- Spend time with family and/or friends who make you laugh.

It is also important to try to find humour in the midst of stress, and learn to laugh at yourself (or the situation) when you face something challenging.

PRECAUTIONS

Although completely safe for most people, vigorous laughing is a form of aerobic exercise and so the same precautions apply for both. Some individuals should practice caution and consult with their doctor before engaging in vigorous laughter, including people who have a hernia, serious hemorrhoids, epilepsy, severe back pain, cardiovascular or respiratory diseases, glaucoma, or utero-vaginal prolapse. Pregnant women, as well as individuals who have recently had surgery, should also proceed with caution.

2. RECORD AND REFLECT ON THE HUMOROUS THINGS THAT HAPPEN TO YOU.

This suggestion is based on a humour intervention that researchers have tested with success called "three funny things" in which participants write down three humorous incidents or events that happened that day, every evening for a week.

One study of this intervention, conducted by Dr. Fabian Gander and colleagues in 2013, found that the participants' happiness was enhanced for up to three months after the intervention, and their depression was reduced for up to six months afterward (compared to the control group participants, who wrote about early memories each evening instead).

3. GIVE SIMULATED LAUGHTER A TRY, IN A GROUP AND/OR ON YOUR OWN.

Look for a Laughter Yoga club to join, either in person or online. Alternatively, purchase Dr. Kataria's book on Laughter Yoga for instructions about how to engage in the practice alone, which is covered in chapter 11.

Interpersonal Psychotherapy

LEARN TECHNIQUES TO FEEL BETTER

Since the outset of the COVID-19 pandemic, everyone has experienced periods of stress and anxiety or, at the very least, confusion and uncertainty about our collective health and well-being. According to a systematic review published in the *Lancet* in October 2021 by the COVID-19 Mental Disorders Collaborators,

> ***the global prevalence and burden of depression and anxiety disorders in 2020 has disproportionally affected females and younger adults when compared to males and older counterparts.***

The review also estimated an increase in major depressive disorder by approximately 27.6% and an increase in anxiety disorders by approximately 25.6% globally when compared to pre-pandemic baselines. Ongoing public health measures with cycles of isolation, quarantine, and lockdown have made it critical to engage in activities that strengthen mental health, build social supports, and reinforce mental health systems across the world.

Mind Over Matter® chatted with Cindy Goodman Stulberg, psychologist and co-author of *Feeling Better: Beat Depression and Improve your Relationships with Interpersonal Psychotherapy*, to discuss the ways in which research-proven tools and techniques can help us overcome challenging situations and manage stress, anxiety, and/or depression.

Interpersonal Psychotherapy was developed at Yale University in New Haven, Connecticut over 50 years ago to complement the treatment of depression with medication. At a time when psychotherapy was generally not used in clinical trials, Dr. Gerald Klerman, a psychiatrist, and Dr. Myrna Weissman, a psychologist, led an innovative maintenance trial with adults to examine the efficacy of weekly supportive psychotherapy focusing on recent life events.

Their trial showed that psychotherapy on its own significantly enhanced social functioning, medication prevented relapse of depressive symptoms, and combined treatment of medication and weekly "high contact" psychotherapy led to the best patient outcomes. Renamed Interpersonal Psychotherapy (IPT), this evidence-based therapy has since been adapted for the treatment of depression and related illnesses such as eating disorders and Post-Traumatic Stress Disorder (PTSD) with diverse age groups (e.g., adolescents and older adults) and populations worldwide, including low-income countries.

Feeling Better offers strategies to build and maintain supportive relationships over the course of a twelve-week period, resulting in improved mood and renewed purpose. Using a self-administered approach based on Interpersonal Psychotherapy (IPT), Stulberg and her co-author, Dr. Ronald Frey, outline skills that everyone – especially those experiencing symptoms of mental disorders and depression – can learn and benefit from.

Q: WHAT IS IPT?

CS: IPT is a short-term, evidence-based therapy that usually lasts eight to twelve weeks. It helps to improve relationships, which then improves mood. In clinical settings, clients learn a new set of skills that can be used to conquer depression and, importantly, help to prevent future episodes.

Q: HOW DOES IPT COMPARE TO OTHER FORMS OF TALK-THERAPY?

CS: IPT focuses on what is happening right now, not on the past. It is based on the premise that dealing with interpersonal stress and building meaningful relationships will help you feel better. It is structured and collaborative and helps individuals articulate and deal with their feelings in a constructive and interpersonal way. Most importantly, it helps individuals become aware of how social interactions can affect the feelings of all parties involved.

Another difference between IPT and other therapies, like Cognitive Behavioural Therapy (CBT), is that there is no written homework or "thought records" to complete. IPT also does not hold individuals responsible for having "irrational thoughts" or "inflexible thinking." In other words, IPT does not focus on what is "in your head." Instead, it emphasizes how you communicate within your relationships, and how that makes you feel.

Q: WHAT SKILLS CAN YOU LEARN THROUGH IPT?

CS: IPT helps you learn how to identify and express what you want from other people in a manner that is constructive and non-confrontational. No fighting involved.

IPT can also help you cope with symptoms of depression that can come from life transitions or the process of change.

For example, being diagnosed with mild cognitive impairment or Alzheimer's disease, job changes, a move, separation, sudden illness, or loss, or becoming a caretaker can lead to loss of →

control and feelings of helplessness. IPT can help you to effectively deal with any of these changes.

Q: IN YOUR BOOK, *FEELING BETTER*, YOU ENCOURAGE READERS TO THINK ABOUT DEPRESSION AND MENTAL DISORDERS IN THE SAME WAY THAT THEY WOULD THINK ABOUT A BROKEN LEG. HOW MIGHT THIS HELP?

CS: Unfortunately, there is still stigma surrounding mental health issues in our society. People blame themselves or feel ashamed if they are depressed. Many suffer in silence. By viewing depression as a medical illness, like pneumonia or a broken leg, people are more inclined to ask for help and to take time off from responsibilities so that they can get better.

As well, when other people start to view mental illness as legitimate as physical illness, they tend to provide care, support, and compassion for those suffering. Given the recent increases in prevalence of depression and anxiety worldwide, it is important that we all work together to recognize and prioritize positive mental health and healing.

Q: THE BOOK WAS PUBLISHED AT THE END OF 2018, TWO YEARS BEFORE THE START OF THE PANDEMIC, AND INTENDED FOR PEOPLE EXPERIENCING DEPRESSIVE SYMPTOMS, WITH OR WITHOUT A DIAGNOSIS. IF YOU WERE TO ADD ANOTHER SECTION TODAY, WHAT MIGHT IT INCLUDE?

CS: If we added to *Feeling Better* today, we would devote more space to acknowledge the added pressures that people are experiencing. Because of COVID-19, there are more challenges to deal with, and more people than ever before are experiencing helplessness, hopelessness, lack of control, and limited contact with friends and family. There are added pressures from assisting family members with virtual school while working remotely and running a household.

Interpersonal Psychotherapy has been used in countries around the world as a first-line psychotherapeutic treatment for individuals, families, and even communities to manage stress related to life transitions and major life events such as becoming a caretaker of a loved one, being diagnosed with mental or physical disorders and disease, and experiencing trauma from violence and war.

We also don't have any particular rituals or strategies to cope with feelings that result from not being able to visit someone in a hospital, and not being able to support one another at a funeral, shivah, or last rites ceremony. Pressures, stress, and conflict have increased, and all of these contribute to mood difficulties.

IPT focuses more on strategies to normalize emotions and modify expectations of ourselves.

We need to teach our children, friends, coworkers, and parents how to support one another as we adapt and create a balanced view of our current situation, putting things into perspective. We need to focus on our good moments and really take pleasure from those.

Q: TELL US MORE ABOUT THE PROCESS OF WORKING THROUGH FEELINGS USING IPT – YOU'VE COMPARED THIS TO ENLISTING A FRIEND TO HELP YOU SORT THROUGH A MESSY BASEMENT!

CS: You may not know everything that you have stored down in your basement over the years. While sorting through your stuff, you could choose to just throw everything away to avoid any potentially painful memories from surfacing. Alternatively, you could sit in a chair and carefully look through what is in all of those boxes and experience a "mixed bag of emotions" all alone. IPT offers a different and ultimately more rewarding approach of going through the piles of boxes with family or friends.

Spend time with someone that you trust to organize and clear the boxes cluttering your mental space, and your mental health will benefit. You'll have some tears, laughter, anger, and frustration, but experiencing these feelings with someone else, even on a video conference or by telephone, is infinitely healthier than experiencing them alone.

Q: THROUGHOUT THE PANDEMIC, RELATIONSHIPS HAVE CHANGED – WHO WE HAVE INVITED INTO OUR SOCIAL BUBBLES (AT VARIOUS STAGES OF LOCKDOWN), HOW WE HAVE COMMUNICATED WITH FRIENDS AND COLLEAGUES (IN-PERSON OR ONLINE), AND EVEN WHERE WE HAVE INTERACTED WITH THEM (INDOORS OR OUTDOORS). *FEELING BETTER* TALKS ABOUT THE IMPORTANCE OF IDENTIFYING YOUR WEB OF RELATIONSHIPS AND KNOWING WHO YOUR "WHOS" ARE. IS YOUR ADVICE ON KNOWING YOUR "WHOS" ANY DIFFERENT TODAY?

CS: The people in your life, or your "whos," are a vital part of IPT. Creating and strengthening key relationships in your life is the foundation for feeling better. We encourage individuals to ask themselves who they know who has gone through something similar to them; who they have talked to in the past that has offered help, support, advice, or encouragement; and who they miss seeing or talking to on a regular basis.

We then help them reach out to their "whos," tribe, or squad (as my kids like to call their friends). We all feel better when someone shows us care and concern. Connecting with "whos" helps us see that we're not the only one who has ever felt this way. Your "whos" can also provide good advice and instill a sense of hope that things will get better.

For some of us, this pandemic has resulted in fewer people in our spheres of influence, making it easier to pinpoint who has offered support and advice when we needed help.

On the other hand, if someone has felt increasingly isolated over the last few years, the process of determining the "whos" that you miss seeing or talking to can help you identify which relationships need to be nurtured. With fewer opportunities for daily social encounters, like coffee breaks with coworkers, generating a list of "whos" may prove to be an insightful exercise with unexpected positive results.

Q: WHAT PRACTICAL ADVICE WOULD YOU OFFER TO SOMEONE WHO FEELS NERVOUS ABOUT CHANGING THE WAY THAT THEY INTERACT WITH THE PEOPLE IN THEIR LIVES?

CS: You're going to experience some anxiety when you begin to think about your feelings and adjust the way you behave around others. Know that this is normal. IPT can help you overcome any apprehensions towards positive change.

I often ask my clients to remember how they felt the first time they rode a bicycle without training wheels. Sure, they felt uneasy, but by making changes on how they ride their bike (and practicing a bit), they eventually experienced the joy of riding on two wheels. IPT is a lot like learning to ride a bike. Change the way you communicate with others, including parents, siblings, or a partner, and you'll soon begin to feel better.

Q: WHAT ROLE DO EXPECTATIONS PLAY IN THE HEALING PROCESS?

CS: Becoming more aware of your expectations and the role it plays in your behaviour is a key aspect of IPT. This awareness begins with the premise that people and situations are not good or bad, or black or white. In a relationship, expectations will differ and change with the passage of time.

For example, if I expect my child to be talkative when she comes home from school, I am going to be disappointed if that is not who she is and she doesn't expect herself to be talkative either. It's not that she's good or bad, or that I am right and she is wrong, it is that we have different desires and expectations.

HAVE YOU BEEN RELUCTANT TO REACH OUT TO SOMEONE? DO YOU KNOW SOMEONE WHO MIGHT FEEL ALONE?

Underpinning the Interpersonal Psychotherapy model is the notion that humans are inherently social beings. As such, maintaining connections with other people is a basic need. Face-to-face contact is important, but if that is not possible, consider alternative ways of maintaining connections and reaching out, like video conferencing, calling by telephone, playing a game together online, sending text messages, and posting letters. Small connections can make a big difference and spreading kindness by reaching out to someone feeling isolated can make you feel better as well.

As another example, if I expect my roommate to help more with chores and my roommate doesn't, that is going to cause me to be frustrated and angry and create stress between us. Again, we may have different desires and expectations.

To resolve an ongoing conflict, you need to identify your expectations of yourself and others.

In turn, you need to understand what their expectations of themselves and of you are. Only then, you can learn how to effectively negotiate the differences. Identifying and managing shared and different expectations will ensure less conflict and improve your mood.

Q: WHAT FINAL THOUGHTS ABOUT *FEELING BETTER* AND IPT WOULD YOU LIKE READERS TO BE LEFT WITH?

CS: Our book aims to make IPT accessible to the public and share its "common sense" approach widely. By focusing on relationships, IPT offers practical strategies that can be used by anyone to improve communication, identify feelings, and positively change their behaviours and mood.

As more people learn about this approach, they can ask their primary care physician to help them find therapists trained using the IPT model. We strongly believe that these strategies can help anyone to manage stress, beat depression, and feel better.

On the Cover

WITH SHINA & KAYUULA NOVALINGA

It is a rare thing for a young woman to credit a parent for building her brand on social media. But that is exactly the way it happened for 24-year-old Shina Novalinga.

"It was my mother. She encouraged me!" Shina said with a laugh, speaking of her mother, Kayuula.

It was on Shina's birthday in 2020 that Kayuula had an idea that changed their lives. She told her daughter that she should post a video of Kayuula teaching her traditional Inuit throat singing. The response was overwhelming.

"The video went viral, with a couple of million views," said Kayuula. It was a transformative experience. Shina, a Montreal-based model, activist, and now social media star, has watched her audience grow to four million followers on TikTok, where she posts about Inuit traditions, often sharing the screen with her mother in videos punctuated with laughter and love.

In one video, the mother-daughter duo demonstrate the traditional Inuit kiss (called "kunik"), in which one person grabs the other's chin and presses her or his nose into the other's cheek. In another, Shina and Kayuula stand facing each other, inches apart, and throat sing (an ancient cultural practice that is considered both a game and a competition).

> IT'S VERY BEAUTIFUL AND SPIRITUAL, AND I WANT TO SHOW IT TO THE WORLD, CHANGE PEOPLE'S VIEWS, AND HOPEFULLY ENCOURAGE OTHER INDIGENOUS PEOPLE TO EMBRACE THEIR TRADITIONS AND CULTURE.

Now, Shina and Kayuula have found a new platform, sharing the cover of the 14th edition of Mind Over Matter®. Modelling for magazines is nothing new for Shina, but this experience is something different.

"I've done covers before but the fact that I get to do this one with my mom...who gets to say that! It's a very special feeling," she said.

The Novalingas are from the small Inuit community of Puvirnituq, Nunavik, located in northern Quebec on the shore of Hudson's Bay. Growing up there, Kayuula has fond memories of how her family would spend the entire summer living on the land in a nearby camp until it was time to return to school. She learned how to sew traditional garments and, most profoundly, was taught throat singing.

As Kayuula explained, the sound of throat singing was inspired by nature and wildlife. Traditionally, women would do it to pass the time during long periods when the men were away hunting. Sometimes it was for pure entertainment, sometimes it was used to settle conflicts, with the woman who lasted longer in an intense singing competition being declared the winner of a dispute. The practice was long supressed by missionaries but is now enjoying a comeback.

When Shina was four years old, Kayuula moved south to Montreal, but ensured that her daughter was exposed to Inuit culture. "She taught me throat singing at the age of seven, but I only took it more seriously a couple of years ago when I was in college," said Shina. "That's when I wanted to learn more to help preserve the tradition."

Having been invited to appear in Mind Over Matter®, Shina and Kayuula are starting to learn more about the mission of Women's Brain Health Initiative to spread the word about positive actions to preserve brain health. "It's definitely important to learn how to take care of yourself," said Shina.

In Inuit tradition, teachings about how to maintain good health are passed down orally from generation to generation. Kayuula vividly remembers a time of stress during her teenaged years when a revered elder told her that she needed to get more sleep – advice that made a real difference in her life. Scientific studies have now proven the wisdom of that elder. Good sleep, one of the pillars of brain health, is an important element in preserving cognitive vitality as you age.

The Novalingas' interview with Mind Over Matter® was filled with laughter as mother and daughter shared jokes, memories, and observations. "Laughing is a big part of our culture. It's our medicine," said Kayuula.

The timing of their photoshoot for the cover was fortuitous. Just a few months earlier, they had gone together to get traditional facial tattoos, an experience that was also shared on social media. For an Inuk person, it is a rite of passage – a way of celebrating important life accomplishments or to honour a person close to her or him.

Having the readers of Mind Over Matter® witness Shina and Kayuula proudly displaying their facial tattoos is a significant moment.

"It's not just tattoos, there's so much meaning behind them," explained Shina. "It's showcasing the beauty of our culture and that we're proud to be Inuit."

The Early Years

COLLABORATING WITH INDIGENOUS COMMUNITIES TO IMPACT YOUNG PEOPLE'S LIVES

The views expressed herein do not necessarily represent the views of the Minister of Health or the Government of Canada.

When Melissa Puff discovered that she was pregnant in early 2019, it was a huge surprise. She had always wanted a sibling for her son, but it had never happened and as the years, then decades, passed, she resigned herself to the reality that she would be a mother of one. Her son was now in his twenties, and she was in her forties when she received the exciting news that another child was on the way.

"It was a beautiful experience. I was so happy to be blessed again," she said.

After years of working as a social worker in cities around Alberta, Puff had moved back home to the Ermineskin Cree Nation. As welcome as her new baby would be, she was concerned that her home was in a secluded location, far from the main community. To help her cope when her second son Jamieson was born, she called upon a parenting program called the "Early Years." Puff received regular visits from a woman named Candace and they would have conversations about being a mother. The experience was incredibly meaningful for Puff.

> **IT HELPED ME IN THE SENSE OF NOT FEELING ISOLATED. IT WAS VERY WELCOMING TO HAVE SOMEONE VISIT. THE RELATIONSHIP BUILDING MADE ME FEEL REALLY GOOD. IT BROUGHT ME UP WHEN I HAD A BAD DAY.**

Puff was well-acquainted with the Early Years, because she had been a staff member herself from the inception of the program, visiting new parents to offer support and advice.

"We're all coming in like a friend, like an old friend, making them feel comfortable."

The Early Years program was launched at the Ermineskin Cree Nation with funding from Brain Canada, the Martin Family Initiative (MFI), and an anonymous family foundation. The project was developed in partnership with the community, as well as Maskwacis Health Services (MHS), which services four First Nations in Alberta. The process is led by the community and the materials are infused with careful attention to Indigenous knowledge.

Community members, typically women with experience raising children, were given training in early childhood development. They pay home visits to women who are about to give birth or shortly after their child's arrival. Equipped with cards that carry a few essential messages about interacting with a baby, the visitors have gentle, respectful conversations with the parents. They are careful to not call it counselling, because that would imply a kind of hierarchy.

"We use the language of visitors walking alongside the parents on their journey. They may have some expertise, but parents are experts on their own children," said Melissa Tremblay, an Assistant Professor at the University of Alberta who is collecting stories and experiences from the program to help measure the outcomes.

> **WHAT I'VE HEARD FROM PARTICIPANTS IS THEY FEEL COMFORTABLE BECAUSE THE VISITORS DON'T COME IN AS EXPERTS, BUT RATHER AS A PEER OR AUNTIE, TO JUST CHECK IN AND SEE WHAT THEIR NEEDS ARE. I'M AMAZED EVERY DAY WITH THE PROGRESS THIS PROGRAM HAS MADE. IT HAS A REAL SOLID FOOTING IN THE COMMUNITY, WHICH ISN'T ALWAYS EASY.**

Early Years goes beyond the conversations in the home, with practical supports for new parents. The program purchased two vehicles, so that they could assist with transport to medical appointments or community gatherings. Home visitors have helped mothers find stable housing and arranged for babies to have traditional Cree naming ceremonies.

Puff took her new son Jamieson to a Sun Dance ceremony, where an elder had a vision of him playing with or picking up dirt. Based on that vision, the elder gave him the Cree name *Anah khametowihmat askiy*, which translates as "he plays with the earth."

"I can't pronounce it, but it was an awesome experience!" said Puff.

The program is a natural outgrowth of the work of MFI, which is led by former Prime Minister Paul Martin, and whose mission is to support Indigenous people in improving health and well-being, always with the attitude of listening and learning about local needs.

"My boss would say it's the most pressing issue Canada faces," said Chloe Ferguson, Director of the Early Years program at MFI.

MFI was already supporting a variety of educational and entrepreneurship programs when Martin and the team learned through community conversations about the need to improve supports for parents and their children. Socioeconomic challenges in Indigenous communities can make life particularly challenging for new parents.

Research has conclusively demonstrated that early life influences can have a profound, long-lasting impact. ⟶

"You cannot waste those first three years; they're key to the rest of your life," Early Years Project Co-Leader Bryan Kolb told Mind Over Matter®. Kolb, a Professor of Neuroscience at the University of Lethbridge, noted that by the age of three, a toddler's vocabulary can vary greatly, spanning anywhere from 300 to 1200 words, depending on whether they have had positive or negative experiences and influences.

Tremblay has heard heartening case studies, including a mother who suffered greatly from postpartum depression with her first three children, but after meeting with Early Years' visitors found that she did much better with her fourth, and was able to successfully breastfeed for the first time.

Tremblay, who is Métis and a mother of three, draws profound satisfaction from her participation in the program. "I'm just so proud and honoured to be part of a program that helps parents to be connected to their past and to see a way forward for their children. When I started my position as an academic, it's exactly the sort of program I hoped I'd be engaged with," she said.

Kolb noted that while the MFI support was crucial, the project would not have happened without the partnership of Brain Canada.

"Brain Canada understood that this is not a typical program. They saw its importance," he said. According to Dr. Viviane Poupon, Brain Canada Foundation President and CEO, the charity is working to further support First Nations, Inuit, and Métis communities to drive Indigenous health research and knowledge translation. The Early Years program embodies an invaluable approach to research, one with a concerted emphasis on relationship building and ongoing co-development with the community – two components that are essential for ensuring that evaluation is embedded throughout in a meaningful and respectful fashion.

"We are proud to support the Early Years program, and we look forward to expanding our activities with the Martin Family Initiative. We recognize the importance of removing administrative barriers restricting access to research funding for First Nations, Inuit, and Métis peoples at both the individual and community levels," explained Dr. Poupon.

There are approximately 150 infants and their parents participating in the Ermineskin Early Years program at any one time and now the program has expanded to the other three First Nations served by Maskwacis Health Services, as well as to communities in the Yukon, Nunavut, and Ontario.

Chloe Ferguson of MFI stresses that, while the central concepts are similar, each project is unique to meet local needs. "The growth is allowing each community and organization to take ownership of how these materials can be used by them," she said.

As both a giver and receiver of the Early Years' home visits, Puff believes that it is making a real difference in her community. "In the long run, I'm hoping we can see healthier, engaged families," she said.

"It's so beautiful watching a mom and her baby, the breastfeeding or the face-to-face engagement with the newborn. Those moments are just wonderful!"

Funding for this project has been made possible by the Canada Brain Research Fund (CBRF), an innovative arrangement between the Government of Canada (through Health Canada) and Brain Canada. To date, Health Canada has invested over $130,000,000 through the CBRF, which has been matched by Brain Canada and its donors and partners.

Thinking Upstream

RECONNECTING WITH NATURE & COMMUNITY FOR DEMENTIA PREVENTION

Available research around the world suggests that there are higher rates of dementia among Indigenous populations compared to their non-Indigenous counterparts. A growing number of studies also indicate that dementia presents differently in Indigenous peoples and there are differences in health-seeking behaviours.

A foundational population-level study of First Nations communities in Alberta, Canada was published in 2013 by Dr. Kristen Jacklin and colleagues in the *Canadian Journal of Public Health*. Data from 1998 to 2009 showed that dementia was increasing at a higher rate within First Nations compared to non-First Nations people.

> *The average age for those with physician-treated dementia among First Nations was ten years younger, and there was a greater proportion of males diagnosed compared to females.*

In other populations, the trend is the opposite, where more females have been diagnosed with dementia compared to males. Dr. Jacklin and her colleagues noted that dementia is often →

The **Canadian Indigenous Cognitive Assessment (CICA)** was adapted from the Kimberley Indigenous Cognitive Assessment developed in Australia and is currently available in Anishinaabe and English.

underreported, leading to underestimates of disease rates overall. Since this publication, the lead author has theorized that higher rates among men likely relate to underdiagnosis of dementia in women, rather than lower incidence. One explanation for this occurrence is that women may be less likely to seek care from health professionals and receive a diagnosis for dementia.

Studies from different countries suggest a higher prevalence and rising cases of dementia among culturally diverse Indigenous communities that live in wide-ranging physical environments. Researchers have turned their attention to the influence of economic and social conditions on the health of Indigenous peoples.

Indigenous populations in Canada, the United States, Australia, Guam, and Brazil experience higher rates of poverty, inadequate housing, and food and economic insecurity when compared to non-Indigenous populations. As it turns out, these poor conditions are shared risk factors with chronic diseases like diabetes, cardiovascular disease, and obesity, and compound the risk for developing dementia.

Globally, Indigenous peoples also report more experiences of racism, social exclusion, and marginalization of their respective traditional health practices, which can adversely impact access to health services and care, as well as the timing of seeking care. For example, in Canada, diverse Indigenous communities (First Nations, Métis, and Inuit) continue to experience poorer access to hospital care and often delay seeking and sharing health information with medical professionals and government institutions due to a long history of mistreatment in residential schools and health-care settings.

> **FAMILY PLAYS A CENTRAL ROLE ACROSS INDIGENOUS COMMUNITIES, WITH FAMILY MEMBERS TYPICALLY ASSUMING FULL CAREGIVING ROLES WHEN A LOVED ONE IS DIAGNOSED WITH DEMENTIA AND PROVIDING AT-HOME CARE FOR AS LONG AS POSSIBLE.**

Moreover, on-reserve long-term care facilities are rare, and there is limited access to external supports like social workers or at-home nurses. This can create stressful home environments, in turn putting family members at greater risk for developing chronic diseases and dementia.

BETTER ASSESSMENTS FOR EARLY DETECTION

There is a clear demand for responsive policies, additional services, and programs that address risk factors and better meet the needs of Indigenous peoples. Dr. Jennifer Walker, an Associate Professor in the Faculty of Health Sciences at McMaster University and a Haudenosaunee member of Six Nations, leads the Indigenous Cognitive Health Program (ICHP) within the Canadian Consortium on Neurodegeneration in Aging (CCNA). Dr. Walker and her team have developed a collaborative research program with Indigenous populations to build resources towards a relationship-centered Indigenous care approach and adapt culturally relevant prevention strategies. As Dr. Walker observed,

> **IN THE LAST FIVE YEARS, WE HAVE SEEN A MAJOR SHIFT IN DEMENTIA RESEARCH LED BY INDIGENOUS PEOPLES. THERE ARE MORE INDIGENOUS RESEARCHERS AND INDIGENOUS-LED RESEARCH PROJECTS, A GREATER NUMBER AND BREADTH OF COMMUNITIES INVOLVED, AND A BETTER UNDERSTANDING OF HOW TO BUILD PARTNERSHIPS THAT CENTRE INDIGENOUS EXPERIENCES.**

Screening tools play an important role in disease prevention, but they are only useful if they are culturally valid. Dr. Walker was part of a large collaborative team that worked closely with First Nations communities on Manitoulin Island over an eight-year period to develop a culturally appropriate screening tool for dementia called the "Canadian Indigenous Cognitive Assessment" (or the CICA).

The tool and training materials were developed with Anishinaabe communities, and consider circumstances and values that are common across Indigenous cultures, such as using a culturally safe and gentle approach to assessment, along with appreciating the role of family and community in diagnosis and care.

Using this tool, Indigenous peoples may be respectfully screened for signs of cognitive impairment. Additional introductory videos were recently added to the toolkit in 2021 to help guide health care workers on using CICA in clinical practice.

As the CICA is used across different Indigenous populations, further refinements and adaptations are sometimes needed. Dr. Walker shared a story from the collaborative development and testing process for CICA in an expansion site with Nakota communities in Saskatchewan. "One of the activities in the CICA was to ask someone to fold a piece of paper. During community consultations, we were told that the paper and direct instruction reminded this group of older people of being in residential schools. Folding a tea towel was suggested as an alternative, with positive associations to home life." Such insights were valuable and made possible because of the trusting relationships and collaborative work with First Nations communities.

THINKING UPSTREAM FOR DEMENTIA PREVENTION

Moving further upstream from early detection of disease to early prevention, the greatest benefits can come from boosting and protecting brain health throughout adulthood and minimizing risk factors for dementia. Indigenous-led health care teams have been actively working to address lifestyle factors with well-established links to a range of chronic diseases and dementia, such as reducing rates of smoking, drug addiction, and sedentary behaviour.

In 2019, CCNA developed a web-based Brain Health Support Program to remotely collect health information, deliver education about dementia prevention, and promote lifestyle changes for enhancing brain health.

Pilot testing of the Brain Health Support Program intervention of the Canadian Therapeutic Platform Trial for Multidomain Interventions to Prevent Dementia (CAN-THUMBS UP) commenced towards the end of 2021 to examine the effectiveness of remote data collection and delivery of programming, so that the modules and processes can be further refined.

> **THE HOPE IS THAT THE BRAIN HEALTH SUPPORT PROGRAM CAN BE DELIVERED WIDELY ACROSS POPULATIONS TO ANYONE WITH ACCESS TO THE INTERNET AND A COMPUTER OR MOBILE DEVICE, TO PROTECT AND PRESERVE BRAIN HEALTH.**

Dr. Joyla Furlano is a Métis postdoctoral fellow in Health Sciences at McMaster University working under the supervision of Dr. Walker. She is also a member of CCNA's Team 18 that focuses on issues in dementia care for Indigenous populations, co-led by Dr. Walker. She is currently developing an Indigenous adaptation of the Brain Health Support Program for CAN-THUMBS UP.

Dr. Furlano's work aims to ensure that the priorities and needs of Indigenous communities are reflected in the modules and that the strategies are culturally relevant, culturally safe, and take geographic and social realities into account.

As Dr. Furlano explained, "The program was previously not developed in consultation with Indigenous peoples and does not have an Indigenous voice. With an advisory group of community partners, I will be going through the Brain Health Support Program and looking at where we can enhance cultural relevancy. We will first look at how to reflect Indigenous cultures in the current text and images, and the second step will be to develop a specific Indigenous adaptation."

> **ONLINE DELIVERY OF THE BRAIN HEALTH SUPPORT PROGRAM MODULES MAY BE ESPECIALLY HELPFUL FOR INDIGENOUS OLDER ADULTS LIVING IN REMOTE AREAS.**

"We need to reach remote communities, especially Indigenous communities, because most of them have less access to health services and resources in general. Indigenous groups are at such a high risk for dementia, so it is very important to include them in this research, tailor virtual resources, and make technology available to them. We envision a program where people can potentially go through the modules with their loved ones," said Dr. Furlano.

Health promotion and health care that leverage technology is not new for Indigenous peoples. Telehealth has been successfully delivered in rural and remote Indigenous communities and is a convenient solution for receiving specialized care with minimal travel. Another benefit of using a technology platform is that health-promoting messages may be delivered through a combination of videos, images, and/or text, making health information more accessible to those with lower levels of health literacy and formal education.

Dr. Furlano is in the initial stages of engaging with community partners to examine the barriers and realities of Indigenous communities and to identify potential adaptations to the Brain Health Support Program that can reflect cultural activities within the support modules.

She explained that it is important to be mindful of cultural elements when promoting brain health. For instance, any references to physical activity as a dementia prevention strategy should reflect the ways that Indigenous peoples move their bodies in harmony with the land and spirit, regardless of their specific cultural community. Traditional activities that are inherently active include spending time on the land and participating in nature-based ceremonies, as well as hunting, fishing, harvesting, and gathering medicinal plants. Many of these traditional activities are performed with other people and can strengthen relationships.

> **SUPPORTING CONNECTIONS TO NATURE AND BEING OUTDOORS HAS ENDURING EFFECTS ON EMOTION AND MOOD, AND CAN HELP INDIVIDUALS RECALL POSITIVE MEMORIES AND EXPERIENCES.**

Such strategies that emphasize and value Indigenous traditions, while simultaneously addressing multiple pillars of brain health, are likely to have the highest levels of acceptability and effectiveness in dementia prevention.

The Indigenous adaption of the Brain Health Support Program has the potential to address the needs of diverse Indigenous communities by focussing on universal desires like strengthening connections with nature, family, and renewing traditional practices. The ultimate goal is that this program will help to offset the growing rate and incidence of dementia among Indigenous peoples.

Making Headway

EXPANSION GRANTS HELP ENSURE RESEARCH EQUITY

Women's Brain Health Initiative's signature fundraising event, the Stand Ahead® Challenge, is delivering on its mission to stand up against research bias and to stand ahead for women's brain health, raising funds for essential research that considers sex and gender differences to combat brain-aging diseases that disproportionately affect women.

The annual December 2nd event, celebrated on Women's Brain Health Day, raises awareness for research inequity, encourages contributions for research that better meets women's needs, and inspires participation in a fun viral challenge – such as performing a headstand, playing a card memory game, or signing your name with your non-dominant hand. Thousands of people have taken part in the Stand Ahead® Challenge and, most importantly, donated. In its first three years, the Stand Ahead® Challenge has raised over $2,000,000, including a crucial boost from The Citrine Foundation of Canada and generous support from Brain Canada, which has matched donations up to $250,000 each year.

Now, those donations are supporting vital new research that incorporates sex and/or gender considerations.

Women's Brain Health Initiative (WBHI) is collaborating with Brain Canada and the Canadian Institutes of Health Research (CIHR) to fund a project led by Dr. Mario Masellis, an Associate Professor in the Department of Medicine at the University of Toronto. This intriguing project is part of a prestigious international initiative, the European Union Joint Programme on Neurodegenerative Disease (JPND).

The views expressed herein do not necessarily represent the views of the Minister of Health or the Government of Canada.

Working with researchers in the Netherlands, Italy, Sweden, and the Czech Republic, Dr. Masellis will examine the interplay between an individual's genetic, cardiovascular, and demographic background (including sex, age, and education) in order to determine how they may interact to increase the risk of developing dementia and/or worsen how dementia is presented. Dr. Masellis and his team will also explore the use of novel methods to unravel the underlying causes of dementia in late life.

While Alzheimer's disease is the most common cause of dementia, many people may also have concomitant Lewy body pathology, frontotemporal dementia pathology, and/or cerebrovascular disease, which also contributes to the clinical manifestations of dementia. Currently, it takes an autopsy to determine whether an individual has a so-called "pure" form of one of those conditions or a mixture of different diseases.

> ***Dr. Masellis and his colleagues are trying to discover a way of accurately diagnosing people while they are still alive.***

"This is really important to know," said Dr. Masellis, who is also a clinician-scientist with the Sunnybrook Research Institute. He told Mind Over Matter® that one reason that dementia drug trials have failed is because they may be targeting one particular condition in a person who may in fact have a mixture.

> **IF WE CAN COME UP WITH A BETTER WAY OF DIAGNOSING AN INDIVIDUAL IN LIFE WITH THE ACTUAL BRAIN PATHOLOGIES CAUSING THEIR DEMENTIA PRESENTATION, THEN WE MAY HAVE A BETTER SUCCESS STORY IN DEVELOPING AND IDENTIFYING NEW DRUGS.**

The researchers will be assessing data from more than 3,000 individuals with dementia in both Canada and Europe. The information will be cross-referenced with a large cohort of 15,000 participants from the Rotterdam Study in the Netherlands, which involves older adults living in the community who have not yet exhibited any signs of cognitive decline.

The researchers want to determine whether they can not only predict the onset of dementia, but also whether it is due to a singular pathology or a combination. An accurate, early diagnosis of dementia offers the hope of targeted treatments that could delay or even stop cognitive decline.

The funding from WBHI, Brain Canada, and CIHR, coupled with support from JPND, means that the project has a budget in excess of CDN$320,198.

"Without their support, we would not be able to answer these challenging questions. The funding contribution from Canada is going to make a difference in the global battle against dementia," noted Dr. Masellis.

Money raised through the Stand Ahead® Challenge is also giving a boost to several researchers who had already received funding, allowing them to further build on their work. Six exceptional research teams have been selected to receive a funding boost of $105,000 each through a new initiative, the Brain Canada-WBHI Expansion Grants: Considering Sex and Gender Program. The goal of the program is to support researchers who want to explore the role that sex and gender play in aging, neurodegenerative disorders, and stroke by implementing sex- and gender-based analysis-driven research hypotheses into their current work.

"Research approaches that consistently account for sex and gender differences drive innovation and scientific rigour," said Dr. Viviane Poupon, President and CEO of Brain Canada Foundation.

"Our role is to enable high-impact research and reduce gender-based health inequities for previously silenced voices. Brain Canada introduces sex, gender, and diversity considerations at every stage of the granting process. We emphasize its importance in the research hypotheses and in doing so we contribute to broadening the potential impact of the work and the potential for new knowledge to be translated into health benefits. We want to help everyone improve their brain health and quality of life, so we must include everyone in the research."

"These kinds of research projects go to the heart of our mission," added WBHI Founder and President Lynn Posluns. "We're so pleased to be able to tell the people who donated to the Stand Ahead® Challenge that their contributions are going to support such critical work."

"This was very timely and wonderful, and I'm really pleased to see Brain Canada and WBHI supporting this type of research," said Dr. Jodi Edwards, one of the first recipients of the expansion grant. Dr. Edwards is the Director of the Brain and Heart Nexus Research Program at the University of Ottawa Heart Institute (UOHI).

She and her team have been exploring the use of non-invasive brain stimulation to assist stroke patients in recovery. Transcranial magnetic stimulation (a form of brain stimulation that uses an electromagnetic coil placed over the scalp to stimulate brain cells) is a treatment that has been used in depression, but also shows great promise in helping the brain to repair the damage caused by stroke. However, exploring its potential for stroke recovery requires large and complex clinical trials. →

Dr. Edwards and her colleagues are building a platform for those trials, which they are calling "CanStim" (short for the "Canadian Platform for Trials in Non-Invasive Brain Stimulation") - an initiative that has already drawn interest from researchers in the U.S. and Europe who are interested in using this platform for their own projects.

> **CRUCIALLY, THE EXPANSION GRANTS WILL ALLOW THE RESEARCHERS TO EMBED SEX AND GENDER ANALYSIS INTO THEIR WORK FROM THE OUTSET OF THE TRIAL DESIGN.**

Women may have a higher risk of stroke than men and suffer more damaging long-term consequences, including being more likely to require long-term care. It is critical to develop new tools to optimize recovery for all stroke patients, and women especially, in order to enable people to live independently in aging.

“This funding is an exciting opportunity to explore these differences and it is so important that WBHI and Brain Canada have recognized that women and men have different recovery mechanisms and trajectories, and that sex should be considered in this research,” Dr. Edwards told Mind Over Matter®.

Dr. Christian Éthier is exploring a different form of potential therapy for stroke recovery. The Associate Professor in the University of Laval’s Department of Psychiatry and Neurosciences is exploring the role of dopamine, a chemical in the brain often associated with pleasure. Using laboratory rats, Dr. Éthier is studying whether stimulating the release of dopamine can assist in repairing a brain damaged by stroke.

“Our experiments are really fundamental. We’re trying to understand the principles by which motor recovery occurs,” he said. Dr. Éthier is using the expansion grant to explore the differences between females and males.

> **DOPAMINE COULD BE MORE IMPORTANT FOR FEMALES, WHICH WOULD INFORM THE DEVELOPMENT OF APPROPRIATE THERAPIES.**

“For me, the expansion grant is very significant because this allowed me to explore something new – to explore untested territory,” Dr. Éthier told Mind Over Matter®.

Dr. Mark Bayley, Program Medical Director and Psychiatrist in Chief at Toronto’s University Health Network-Toronto Rehabilitation Institute, along with the team from the CanStroke Recovery Trials Platform, is investigating a global issue with implications that resonate beyond stroke research: the challenge in recruiting an equal number of women and men to participate in clinical studies.

> *Although women make up the majority of stroke patients, they sometimes represent only 20-30% of the participants in studies.*

“This has been recognized as a worldwide problem in research. The evidence for most care may be fundamentally flawed because of the under-recruitment of women in research. We’d like to understand why,” said Dr. Bayley, who is also a scientist with the Canadian Partnership for Stroke Recovery.

His expansion grant will be used to investigate the reasons behind the sex disparity and to identify tactics for improving female participation.

Led by colleagues Dr. Shannon MacDonald of Toronto’s Sinai Health System, Dr. Susan Marzolini of University Health Network (UHN) in Toronto, Dr. Amy Yu of Sunnybrook Hospital, and Dr. Janice Eng of University of British Columbia, the project will survey up to 200 individuals who had previously participated in research projects, with the goal of discovering what made it easier to take part in the study and what made it more challenging.

The research team has their suspicions as to why women turn out in lower numbers, including issues with the recruitment approach, caregiving responsibilities, lack of transportation, and/or insufficient support from a life partner. The researchers are seeking to provide specific information that can inform the development of a best practices guide to improve female participation.

“We’re very grateful for this funding. It will help us build a foundation of science based on the whole of the human population. The results of this research might actually inform not just Canadian stroke recovery research but other research we do in Canada in many other fields,” said Dr. Bayley.

For Dr. Janelle Drouin-Ouellet, funding from Brain Canada has been crucial in launching her career and now the expansion grant is allowing her to further develop her work. An Assistant Professor at the University of Montreal’s Faculty of Pharmacy, Dr. Drouin-Ouellet previously received a Future Leaders in Canadian Brain Research grant aimed at early career researchers, which enabled her to embark on a project exploring Parkinson’s disease. Her work uses an innovative technique that involves converting skin cells from seniors into microglia, which are the immune cells in the brain that are affected by Parkinson’s.

Dr. Drouin-Ouellet mimics the effects of Parkinson's disease on those cells in a petri dish, and studies how they react to different treatments. The latest funding will allow her to explore sex differences.

Men develop Parkinson's disease more frequently than women and we need to increase our understanding as to why this is the case.

"Once we understand the biology, the mechanisms underlying this, then we can perhaps look for sex-specific therapies," said Dr. Drouin-Ouellet.

She will study how female and male microglia react differently to the stresses of the disease and will endeavour to treat male cells with female hormones and female cells with male hormones to see if this has a beneficial or negative effect. It is a line of research made possible by the new round of funding.

"As a young principal investigator, this is tremendously helpful. It allows me to build on what we've done so far," she said.

Dr. Jonathan Epp, Assistant Professor in the Department of Cell Biology and Anatomy at the University of Calgary, also benefited from an early career grant from Brain Canada, which allowed him to pursue a project that he believes other funding bodies might have viewed as too high risk. Using mice, he is exploring potential interventions that could reduce cognitive decline in individuals with Alzheimer's disease (AD), focusing on how different parts of the brain communicate with each other.

> **IN WOMEN WITH AD, COGNITION TENDS TO DETERIORATE MORE RAPIDLY THAN MEN, POTENTIALLY IN PART BECAUSE THERE IS A GREATER DISRUPTION IN CERTAIN BRAIN NEURONS.**

Dr. Epp has been exploring whether cognitive deterioration can be slowed by housing mice in an environment with more stimulation, including more opportunities for exercise. With the expansion grant, he is broadening his explorations by using cutting-edge techniques such as optogenetics and chemogenetics to study their impact on brain neurons. Optogenetics is a way of stimulating neurons through the application of light, while chemogenetics uses drugs to achieve a similar purpose.

"The most important thing from a therapeutic point of view is to find the correct targets to go after, and that's what we're interested in the mouse models," explained Dr. Epp. A central element of his project will involve studying how the stimulation affects females and males differently.

"I was really excited to see this expansion grant focusing on sex differences. To me, it's a very important area of research because there's so much there that we don't know because a lot of the past work has just been done in males. Sometimes that completely washes out the effects."

> ***Even less is known about the subject that Dr. Gillian Einstein's team is exploring – the effect of long-term hormone therapy on the cognition of trans women.***

"From a human point of view, from the perspective of what is just, this group deserves to have more known about their physiology and their brain health so that ultimately we can have precision medicine for this group of people as well," said Dr. Einstein, who, with support from WBHI and CIHR, holds the Wilfred and Joyce Posluns Chair in Women's Brain Health and Aging at the University of Toronto, the first research chair of its kind in the world.

She also feels that it is essential to have a trans woman playing a central role as a researcher in the project. Reubs Walsh, a British researcher, is relocating to Toronto and will lead the study as a postdoctoral fellow. Walsh has received postdoctoral funding from WBHI, The Citrine Foundation of Canada, and the University of Toronto Arts and Science Postdoctoral Fellowship.

"We know from the literature on post-menopausal aging in cis women that hormone therapy is controversial. So, we want to understand how it might affect cognition in this population of women. There's been very minimal research in this area," said Dr. Einstein.

The initial funding from WBHI launched the project and now the expansion grant will allow her team to include brain imaging, detailed interviews, and in-person cognitive testing. The research also plans to measure cortisol (the stress hormone) to better understand the impact of stress, which is a common challenge among trans people.

"I'm so excited about this project," said Dr. Einstein. "We couldn't do it without this expansion funding, and it means we can take it on with a team of individuals that includes trans people participating in an effective way."

Funding for this project has been made possible by the Canada Brain Research Fund (CBRF), an innovative arrangement between the Government of Canada (through Health Canada) and Brain Canada. To date, Health Canada has invested over $130,000,000 through the CBRF, which has been matched by Brain Canada and its donors and partners.

Great Minds Think Alike

RECOGNITION FOR THE INITIATIVE

As Women's Brain Health Initiative (WBHI) approaches its landmark tenth anniversary, there are multiple signs that the charitable foundation is having an impact and truly making a difference. Recently, there was a huge boost of support for WBHI with the announcement that the Public Health Agency of Canada (PHAC) approved a substantial grant of $716,000 from the Dementia Strategic Fund for a two-year brain health awareness campaign.

> **THIS DIRECT FUNDING FROM THE FEDERAL GOVERNMENT WAS A POWERFUL SIGNAL THAT DECISION MAKERS RECOGNIZE THE IMPORTANCE OF WBHI'S MISSION.**

There are big plans for the Initiative, all growing out of WBHI's flagship information vehicle, the magazine you are reading. The Mind Over Matter® brand is now branching out to multimedia channels. WBHI has just launched a podcast and video series, delivering its messages about brain health in engaging ways that will reach new audiences.

The first video features nutritionist, caterer, and cookbook author Rose Reisman with great advice about "mindful eating," while the debut podcast focuses on the importance of exercise, with guest Dr. Jennifer Heisz, a brain health expert who is an Associate Professor in the Department of Kinesiology at McMaster University and Director of the NeuroFit Lab.

These are new initiatives for WBHI and we are keen to hear what you think because your feedback will help shape the focus of future programs.

Coming soon, thanks to the PHAC grant, is a Mind Over Matter® App, which will bring you essential information about the "six pillars" of brain health and the ways in which you can reduce your risk of cognitive decline. In addition to the PHAC funding, these exciting new platforms are made possible thanks to our program partners York University, BitBakery, TELUS, RBC, Home Instead, The Citrine Foundation of Canada, and RB33.

WBHI is also thrilled with the reception for its new educational initiative, Brainable™. It is an innovative program that expands WBHI's reach to a new and younger audience – students in grades five through eight. Increasing evidence indicates that it is never too early to start learning about how to take care of your brain, which is why Jade Crystal (Program Director of Brainable™) developed a learning module that tailors essential brain health messages for middle schoolers.

Brainable™ was tested in ten Ontario schools in the fall of 2021, with the feedback used to fine-tune the materials before rolling out the program to the Greater Toronto and Hamilton Area (GTHA) starting in January of 2022. The response was overwhelming with bookings quickly filling up, putting the program well on track to meeting its goal of reaching 5,000 students by the end of June 2022, all at no cost to the schools, thanks to the generosity of the Ontario Ministry of Education and WBHI donors.

> **IT HAS QUICKLY BECOME CLEAR THAT THERE IS A STRONG DEMAND FOR THE BRAINABLE™ PROGRAM, AND WBHI IS ACTIVELY EXPLORING AVENUES FOR BRINGING IT TO MANY MORE STUDENTS ACROSS THE COUNTRY.**

The WBHI messages about brain health and supporting research that explores the differences between the sexes are resonating at the highest levels. Health Canada's declaration that December 2nd would be recognized nationally as Women's Brain Health Day gave official recognition to the cause and brought a greater sense of occasion to WBHI's signature viral fundraising initiative, Stand Ahead®.

At the December 2021 virtual event, two federal ministers spoke in support, with the Honourable Carolyn Bennett, Minister of Mental Health and Addictions and Associate Minister of Health, citing the joint funding provided by the Canadian Institutes for Health Research (CIHR) for the Wilfred and Joyce Posluns Chair in Women's Brain Health and Aging, held by Dr. Gillian Einstein at the University of Toronto.

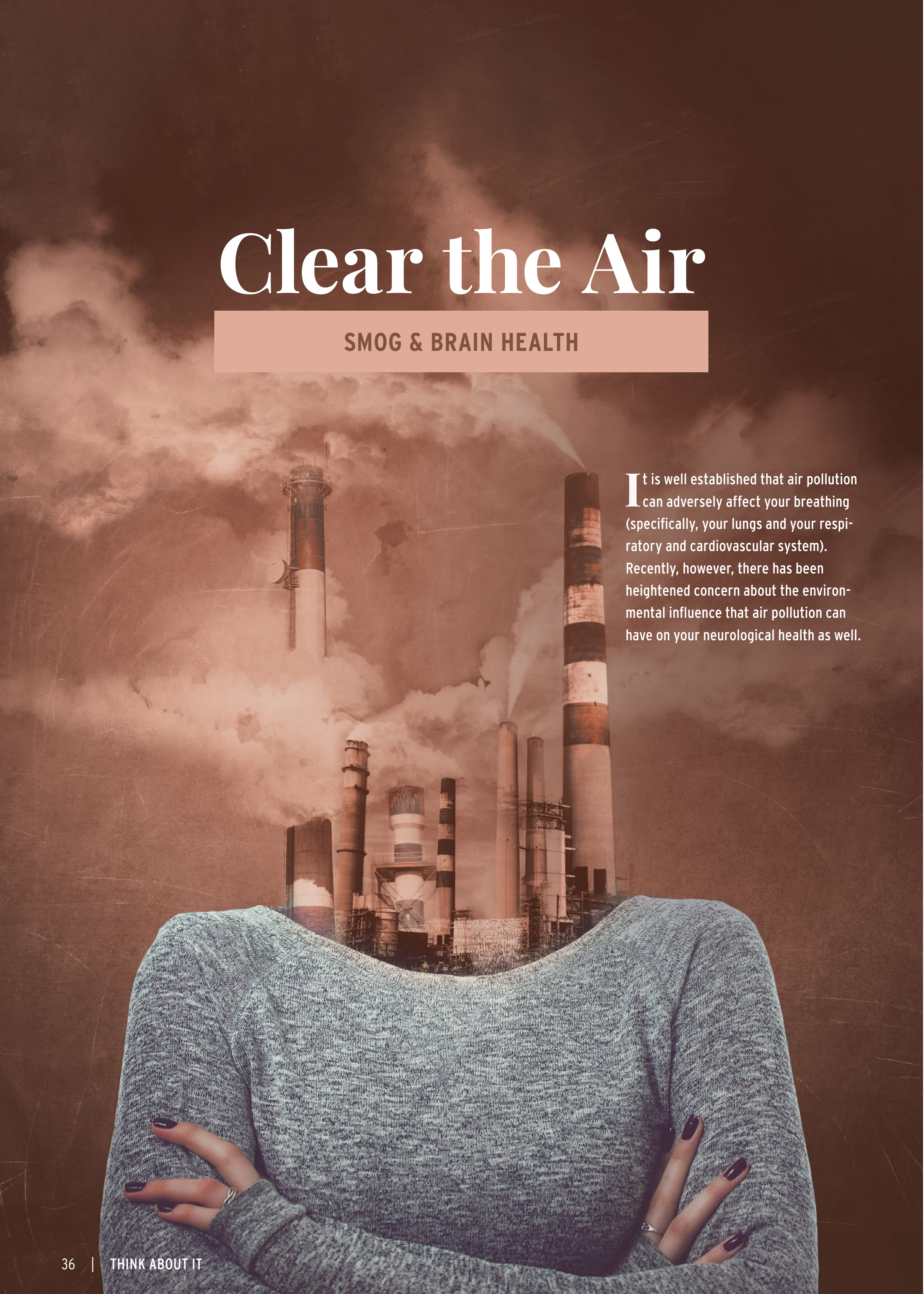
"It's been truly important for the Government of Canada to fund leading-edge research into women's brain health," said Bennett.

> **GILLIAN EINSTEIN IS TRANSLATING RESEARCH INTO GENDER AND SEX-SENSITIVE INTERVENTIONS TO IMPROVE BRAIN HEALTH IN AGING WOMEN.**

The Honourable Marci Ien, Minister for Women and Gender Equality and Youth, added: "On behalf of our government, thank you for every single thing that you have done and for your dedication for protecting women's brain health from coast to coast."

Perhaps the highest compliment bestowed on WBHI came when we learned in December 2021 that WBHI Founder and President, Lynn Posluns, was appointed a Member of the Order of Canada, one of our nation's highest civilian honours. Presented by the Governor General, the Order recognizes outstanding achievement, dedication to the community, and service to the nation. Lynn was cited for her "contribution to research on cognitive health and aging through the founding of Women's Brain Health Initiative."

We could not have said it better. Lynn never fails to recognize WBHI's many donors, supporters, and friends for the success of this charity. The WBHI family celebrates with pride this well-deserved honour for her.



Clear the Air

SMOG & BRAIN HEALTH

It is well established that air pollution can adversely affect your breathing (specifically, your lungs and your respiratory and cardiovascular system). Recently, however, there has been heightened concern about the environmental influence that air pollution can have on your neurological health as well.

There is mounting evidence linking a variety of neurological issues to polluted air, and troubling recent findings indicate signs of Alzheimer's disease in the brains of children living in smog-filled cities.

In short, the fine particles that we are inhaling are being carried through our bloodstreams and can make their way directly to the brain. The immune system can react to the particles in the lungs or bloodstream too, triggering widespread inflammation that affects the brain.

There is a considerable amount of research that suggests that this type of inflammation is associated with an increase in cognitive decline and may also contribute to Alzheimer's disease and other types of dementia. This is particularly concerning given the steady rise in global air pollution and the dire consequences that it is having on our environmental and personal health.

In 2018, the World Health Organization (WHO) identified air pollution as the second-largest risk factor for noncommunicable disease worldwide. The organization also reported that globally, more than 90% of individuals breathe air that fails to meet WHO standards.

One of the strongest associations between air pollution and brain health was observed in the early 2000s when the population from Mexico City - a location that the United Nations had previously declared the most polluted city on the planet - began exhibiting signs of DNA damage, inflammation, degradation of the blood-brain barrier, and even Alzheimer's-type pathology in the stray dogs living in the area.

Dr. Lilian Calderón-Garcidueñas, a Professor at the University of Montana in the Department of Biomedical and Pharmaceutical Sciences, is one of the lead researchers connecting air pollution to cognitive brain decline. Her field of study focuses on the chronic effects of exposure to air pollutants in clinically healthy children and the impact in the brain pathology of canines.

Based on magnetic resonance imaging (MRI) scans, cognitive tests, and measures of inflammatory markers in the blood of young children living in Mexico City, Dr. Calderón-Garcidueñas and her colleagues identified neuroinflammation, brain structure changes, cognitive deficits, and Alzheimer's-like pathologies in apparently healthy children, compared with a group of similar children in a less polluted city. The findings, according to the researchers, suggest that polluted air may spur brain disease at far younger ages than previously suspected.

WHAT QUALIFIES AS AIR POLLUTION?

Air pollution is a combination of the gases, fuels, chemicals, and particles emitted from cars, trucks, buses, factories, equipment, and products that are used in our daily lives (including lawnmowers, cleaners, and solvents), which is transmitted through the air that we breathe. Air pollution levels are at the highest where there is the greatest amount of activity, such as in cities and industrial areas.

The Environmental Protection Agency (EPA) in the United States has identified the following six pollutants as "criteria" air pollutants and regulates them by setting permissible levels to safeguard our health and the environment:

1. CARBON MONOXIDE;
2. LEAD;
3. NITROGEN OXIDES;
4. GROUND-LEVEL OZONE;
5. PARTICLE POLLUTION (OFTEN REFERRED TO AS PARTICULATE MATTER); AND
6. SULFUR OXIDES.

Ground-level ozone constitutes one of the main components of photochemical smog and is produced when certain pollutants react with sunlight. When inhaled, photochemical smog can cause significant lung and breathing complications.

RESEARCH HIGHLIGHTS

Dr. Marta Crous Bou, an author and scientific collaborator with the Barcelonaβeta Brain Research Center (BBRC), released the results of a recent study that significantly emphasizes the relationship between air pollution and cognitive brain health. The researchers found that the tiny, suspended particles and gases in air pollution, produced primarily by road traffic, may be an environmental risk factor for Alzheimer's disease.

The findings (which were published in the December 2021 issue of *Environmental International*) suggest that air pollution may have a particular effect on individuals who already have disease biomarkers, in this case, beta-amyloid deposition in the brain, and that exposure may contribute to the progression of the disease.

Supporting this theory is some additional research based in Ontario, Canada that has found that living farther away from a major road can lower one's risk of developing dementia. This study (which was co-authored by Dr. Ray Copes, the former Chief of Environmental and Occupational Health at Public Health Ontario) was published in the *Lancet* in 2017.

Another study published in *PLOS* in 2015 involving nearly 3,000 schoolchildren in Barcelona who attended schools in areas with poorer air quality (frequently the result of more traffic pollution) came to the same conclusion when the children were found to have slower cognitive development. ⟶

A team of researchers from the University of Southern California in the United States published another study in 2017 in *Translational Psychiatry* that examined the exposure of particulate matter in the air – and specifically, how it impacted women – and found a direct link between air pollution and brain health. Dr. Mafalda Cacciottolo and colleagues analyzed data from a group of older women from the Women's Health Initiative Memory Study (WHIMS), as well as monitored female experimental mouse models. The researchers found that living in locations where ambient particulate matter exceeded the EPA's recommendations nearly doubled women's risk of developing dementia. Additionally, exposure to urban airborne particulates appeared to intensify amyloid accumulation and neurodegeneration, and the neurodegenerative effects of airborne particulate matter may involve gene-environment interactions with APOE ε4 (the major genetic risk factor for pathological brain aging and Alzheimer's disease).

Dr. Jennifer Weuve, an Assistant Professor of Internal Medicine at Rush Medical College in Chicago, Illinois, also led a gender-based study that focussed on the impact of air pollution on women and their cognitive brain health. Using data from the Nurses' Health Study Cognitive Cohort, which included more than 19,000 older women between the ages of 70 and 81, the study measured the women's exposure to air pollution particulate matter based on their individual locations.

The study, published in the *Archives of Internal Medicine*, found that a woman's cognitive health declined based on the length of exposure and the levels of pollution. "The conventional wisdom is that coarse particles aren't as important as fine particles when it comes to human health," noted Dr. Weuve. "Previous studies in animals and human cadavers had shown that the smaller particles can more easily penetrate the body's defenses. They can cross from the lung to the

HOW IS AIR POLLUTION MEASURED?

Air pollution is scientifically measured by fine particle matter and coarse particle matter. **Fine particles** are generally 2.5 micrometers in diameter or less and originate from natural or human-made sources (e.g., vehicle exhaust, wildfires, power plant emissions, and other combustion activities). **Coarse particles** are larger particles generally ranging from 2.5 to 10 micrometers in diameter and originate from sources such as construction work, road dust, or natural dust storms.

The **Air Quality Index (AQI)** is a universal measurement tool that runs from 0 to 500 and is used as a guide for reporting daily air quality. The various levels (six in total) are linked to different impacts on human and environmental health. The lowest level of concern and safest air quality, green, is experienced when the air quality is at level 50 or below. On the contrary, an AQI level that reaches 301 or higher is hazardous.

AQI LEVELS OF HEALTH CONCERN	NUMERICAL VALUE	MEANING
GOOD	**0 to 50**	Air quality is considered satisfactory, and air pollution poses little or no risk.
MODERATE	**51 to 100**	Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution.
UNHEALTHY FOR SENSITIVE GROUPS	**101 to 150**	Members of sensitive groups may experience health effects. The general public is not likey to be affected.
UNHEALTHY	**151 to 200**	Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects.
VERY UNHEALTHY	**201 to 300**	Health alert: everyone may experince more serious health effects.
HAZARDOUS	**301 to 500**	Health warning of emergency conditions. The entire population is more likely to be affected.

blood and, in some cases, travel up the axon of the olfactory nerve into the brain." This study, however, found that that exposure to both fine and coarse particles was associated with cognitive decline.

WILDFIRE SMOKE

A key contributor to the increase in air pollution is the rise in wildfire smoke. Research suggests that wildfire smoke is responsible for an estimated 40% of particulate matter pollution. As drought seasons become more prolonged, and growing deforestation rates make way for agriculture development, so do the risks of wildfires.

Large-scale wildfires release carbon emissions, smog, and pollutants into the air, which can spread across countries and regions. In July 2021, an unprecedented heatwave and wildfires in the western regions of North America caused cities on the East Coast (including New York) to be shrouded in smoke and polluted air. Similarly, Siberia experienced one of the worst wildfires during the same period where smog reached dangerously high levels, forcing more than 280,000 residents to remain at home.

In an effort to encourage countries to improve their air quality, the World Health Organization recently set new acceptable limits for particulate matter measurement that were reduced by half, while diesel engine nitrogen dioxide levels were cut by 75%, with the goal of making a significant difference and improvement in overall environmental and human health. According to the WHO, if the world collectively reduced its air pollution levels to those in the new guidelines, nearly 80% of air pollution-related deaths could be prevented.

The challenge, however, is that the new guidelines may not be very realistic. Currently, no major city can meet the guidelines according to an analysis conducted by Greenpeace.

THE IMPACT OF THE COVID-19 PANDEMIC ON AIR POLLUTION

The stay-at-home orders over the past two years have undoubtedly reduced the amount of air pollution that would ordinarily arise from the exhaust from traffic, transportation, and fossil fuel use.

The 2020 World Air Quality Report (a detailed commentary on the air pollution data and comparative AQI scores of 106 countries) revealed that improvements in air pollution were observed in a total of 67% of global cities as a result of the pandemic.

The report noted that "as billions sheltered in place for weeks at a time, transitioned to remote-work where possible, and limited movement to essential trips, dramatic air quality improvements were observed around the world in what has been described as an unprecedented air quality experiment. The connection between COVID-19 and air pollution has shone new light on the latter, especially as many locations have observed visibly cleaner air – revealing that air quality improvements are possible with urgent, collective action."

HOW DOES CANADA RANK GLOBALLY IN AIR POLLUTION?

Canada holds the 97th position in a ranking of 106 countries with an air quality level of 30. This is considered "green" and is in stark contrast to Bangladesh, which is the number one ranking country with a pollution score of 162. The highest-ranking city in the world is Delhi, India with a disconcerting score of 267.

HOW DO SOME OTHER COUNTRIES MEASURE UP?

FRANCE	46
JAPAN	40
UNITED STATES	40
UNITED KINGDOM	34
ICELAND	30
NEW ZEALAND	29
NORWAY	24
PUERTO RICO	15

**Live AQI city and country rankings can be found on iqair.com.*

WHERE DO WE GO FROM HERE?

The United Nations has recently recognized air pollution as the greatest environmental health risk. The *Lancet* reported that air pollution was responsible for an estimated 6.7 million deaths globally in 2016. The research unnervingly predicts that the number of deaths will more than double by the year 2050 if no action is taken.

The financial impact on economies must be taken into consideration as well.

> **IN CANADA ALONE, THE SOCIAL, ECONOMIC, AND PUBLIC WELFARE CONSEQUENCES OF ILLNESS AND DEATH ASSOCIATED WITH AIR POLLUTION HAVE AN ESTIMATED ECONOMIC VALUE OF $114 BILLION PER YEAR.**

The good news is that air pollution can be controlled and the growing recognition of air pollution as a potential contributor to neurological disease will ultimately lead to improved brain health. It is therefore critical to encourage the development of robust environmental policies (such as carbon emission caps), as well as support local and national air quality initiatives, and hold governments and countries accountable when they fail to meet the environmental guidelines. In the end, our collective efforts will result in a healthier planet and a healthier you – which means a healthier brain as well!

When the Brain Loses Control of the Body

DISCOVERING NEW THERAPIES FOR ALS

Muscle weakness, poor balance, difficulty breathing, and/or slurred words may be the first symptoms to appear in someone with Amyotrophic Lateral Sclerosis (ALS). Symptoms may be subtle and gradually worsen over time, or may be obvious with rapid degeneration.

WHAT IS ALS?

ALS is a rare and devastating disease that affects the nerves that control muscles (motor neurons) throughout the body. ALS may initially appear in any muscle group, on any side of the body, and progressively destroys the nerves in the brain and the spinal cord that are responsible for voluntary movement.

When the brain cannot communicate with the muscles of the body, the muscles weaken and cannot serve their function. For example, if muscles in the throat are affected, then this leads to difficulty in swallowing, and if muscles in the chest are affected, then this leads to difficulty in breathing. As time passes, both sides of the body are affected until an individual with ALS becomes paralyzed.

The average age at the time of diagnosis is 55, with most people developing the disease between 40 and 70 years of age.

> ***ALS is 20% more common in men than women at younger ages, but prevalence rates are similar among older adults.***

A 2019 meta-analysis conducted by Dr. Lu Xu and colleagues examined 58 studies of ALS prevalence from countries worldwide. The overall prevalence of ALS was less than five out of 100,000, with the longest survival time being in Asia (ranging from 3.74 years after diagnosis in South Asia to 9.23 years in West Asia).

The ALS Society of Canada (ALS Canada) estimates that there are currently more than 200,000 people around the globe living with ALS, and most of these cases are not hereditary. In fact, Tammy Moore, the Chief Executive Officer of ALS Canada, noted that in approximately 90-95% of cases, there are no genetic factors in developing the disease.

There is some evidence that people who have served in the military are at a higher risk of developing ALS, and there are some instances where spouses have been diagnosed with ALS, suggesting that there are interactions between genes and the environment that lead to the disease and contribute to disease progression. Nevertheless, for the most part, people who are otherwise healthy can develop ALS, and there are no obvious risk factors that would predispose someone to the disease. ⟶

Currently, there is no known cure for ALS, and approximately 80% of individuals die within two to five years after diagnosis.

ALS, COGNITIVE IMPAIRMENT, & DEMENTIA

In the last decade, we have learned that there are interrelationships between motor neuron diseases like ALS, cognition, and behaviour. Limited population-level research shows that as many as half of all ALS patients demonstrate symptoms of cognitive impairment (e.g., difficulty concentrating or making complex decisions), and up to one-third meet clinical criteria for dementia (mainly frontotemporal dementia).

The impact of cognitive impairment, sometimes in conjunction with behavioural impairment, is starting to receive attention, with studies examining management and treatment options for caregivers and medical teams. Individuals with ALS and cognitive impairment tend to die sooner than those without such impairments, though it is not fully understood why this is the case.

> **DIAGNOSING COGNITIVE AND BEHAVIOURAL IMPAIRMENTS PRESENTS MANY CHALLENGES IN INDIVIDUALS WITH ALS.**

For example, degeneration of motor neurons in facial muscles can affect speech, and degeneration of motor neurons in hands can affect writing. Diagnostic tests for dementia often require individuals to provide verbal responses (e.g., repeating a sequence of words) or written responses (e.g., drawing a picture of a clock). Alternate diagnostic tests must be used if speech and/or writing is impaired.

Another factor is the variability of ALS and disease progression. It is not possible to use the same set of diagnostic tests for dementia in all patients with ALS.

Yet another consideration is that tracking progression of cognitive impairments over time (e.g., progression of mild cognitive impairment to dementia) is usually done by repeating a test. In patients with ALS, screening measures used at baseline (i.e., the first assessment) may not be valid or possible to administer a year later if physical function related to speech and/or writing worsen.

SYMPTOMS OF DEMENTIA IN PATIENTS WITH ALS

While there are a range of symptoms that characterize dementia in individuals with ALS, the most common impairments noted are changes in executive function – that is, processes regulating and controlling thoughts and behaviours.

Amyotrophic Lateral Sclerosis (ALS) is often confused with **Multiple Sclerosis (MS)** and **Muscular Dystrophy (MD)**, but there are important differences.

ALS is a rare, progressive, and fatal disease that affects the nerves responsible for muscle function. Less than 10% of all cases of ALS are hereditary.

MS is an unpredictable disease of the nerves in the brain and spinal cord that has some hereditary links, and is not fatal. MS can be managed by various treatments so that patients may live an average lifespan. MD refers to a group of muscle disorders that are hereditary or caused by a genetic mutation. All types of MD cause muscle weakness, and life expectancy varies depending on the disorder.

Less common are impairments to memory and mental processing. Impaired executive function may appear as exaggerated behaviours (such as repeating actions or getting stuck on thoughts) or the absence of behaviours (such as social withdrawal or lack of empathy for others).

> **A DIAGNOSIS OF MILD COGNITIVE IMPAIRMENT OR DEMENTIA PLAYS A CRITICAL ROLE IN DISEASE MANAGEMENT PLANS FOR INDIVIDUALS WITH ALS BY HELPING TO SET EXPECTATIONS AND GOALS FOR DAILY FUNCTION AND PROMOTING QUALITY OF LIFE.**

Family members and caregivers need to know when to provide help and when to provide support and encouragement so that people with ALS can live with dignity. For example, if caregivers understand that there may be medical reasons for being pushed away by a loved one with ALS, then they can safeguard their emotional responses, try to be more patient, and try not to take these behaviours personally.

A diagnosis of cognitive impairment is also instructive for health care teams to know whether caregivers must be present and how to communicate information related to treatment and management. Like any other person with cognitive impairment or dementia, a diagnosis can help to identify appropriate therapies and behavioural strategies for managing symptoms.

Amyotrophic Lateral Sclerosis (ALS) is commonly referred to as **Lou Gehrig's disease**, after a professional baseball player for the New York Yankees who developed the disease in 1939.

Some research has shown that managing cognitive impairments promotes adherence to ALS therapies and can therefore prolong survival.

DEVELOPING & TESTING NEW ALS THERAPIES

The diverse nature and presentation of ALS across individuals necessitate a multidisciplinary approach to therapies. “If you and I both have ALS, your disease is going to be distinct from my disease. We want to have our respective versions of disease understood, so we can get closer to a place of precision medicine, and closer to understanding the underlying factors for maximum therapeutic benefit,” explained Moore.

Canadian researchers are currently exploring new avenues for ALS research by looking deep into the brains of mice that possess the same gene mutation (SOD1) found in some human ALS patients. Dr. Melanie Woodin, a Professor in the Department of Cell & Systems Biology at the University of Toronto, and her research team recently discovered that electrical activity is profoundly altered early in the disease. By making electrical recordings from the motor cortex (the region of the brain that controls muscles), they found that electrical activity was reduced, which they believe may underlie the development of symptoms.

To test their hypothesis, the researchers artificially increased neuron activity using a recent advance in viral technology combined with a revolutionary technique in neuroscience called “chemogenetics,” and then monitored for symptoms. They found that restoring electrical activity in the brain early in the disease delayed the deterioration of motor skills and increased survival. Although these results point towards a path for a potential treatment in humans, Dr. Woodin remains cautiously optimistic at this time, as the research was conducted in an animal model of disease.

Worldwide, there are several ongoing clinical trials to slow down the rate of nerve and muscle destruction.

With the disease progressing rapidly for most patients, and severe loss of function typically occurring within the first year, it is critical to be diagnosed as early as possible and have access to ALS therapies from the moment of diagnosis.

“Symptom onset starts the trajectory of the disease and is a consideration for whether you will be accepted into a clinical trial or put into a therapy. The Canadian Neurological Disease Registry shows that the time to receive diagnosis varies significantly but is upwards of 18 to 24 months for some. This means that you could have passed the treatment window before you even received the diagnosis.”

To decrease the time for diagnosis, ALS Canada has created a National Research Forum, bringing together researchers and clinicians to collaborate and share ideas. Over the last few years, this forum has become an engaging virtual experience that ensures that patient voices are heard and included in the decision-making process.

Another consideration for individuals with ALS is that as the disease progresses, patients are not as mobile and cannot travel great distances for therapy. To address this issue, ALS Canada has created clinical fellowships for physicians. Physicians gain critical knowledge and then can establish multi-disciplinary clinics and trials in various locations across the country, bringing therapies closer to the patients that need them.

There are also international working groups openly sharing data and developing new approaches to manage ALS at a faster pace than ever before.

Dr. Angela Genge is an Associate Professor at McGill University and Medical Director of the Clinical Research Unit at the Montreal Neurological Institute (The Neuro) in Québec, Canada. Dr. Genge has brought internationally developed therapies to Canada so that patients can receive the best possible care available.

Dr. Genge has also initiated novel ALS therapies and care approaches, and spearheaded clinical trials in Canada with the hope of changing →

Frontotemporal dementia (FTD) refers to a group of dementias involving degeneration in the frontal and temporal lobes of the brain, and accounts for less than 20% of all dementia cases. Symptoms of FTD usually manifest between the ages of 45 and 65 and result in gradual changes in behaviour and personality (e.g., becoming less social and lacking control over emotions), and/or changes in language. Memory is generally not affected.

In contrast, **Alzheimer’s disease (AD)** is the most common cause of dementia, involving accumulation of proteins outside neurons, and twisted strands of proteins inside neurons in the brain. AD accounts for approximately 60-80% of all dementia cases, and first affects memory, and then shows as disorientation, confusion, and impaired communication. Symptoms of AD may take over two decades to emerge; therefore, patients with AD are generally older than those with FTD.

the course of the disease and promoting quality of life for those with ALS and their caregivers.

In the last five years, there have been significant advances in funding, drug development, and potential therapies for ALS, with The Neuro at the forefront of innovation. "The Neuro is an international leading centre for both innovative programs that are investigator-initiated and the most cutting-edge clinical trials in ALS from phase one onwards," said Dr. Genge.

One such clinical trial, co-led by Dr. Genge and Dr. Eran Hornstein from the Weizmann Institute of Science, is examining ways that enoxacin may be used in ALS treatment. The research team was awarded funding from ALS Canada and Brain Canada through their 2020 Discovery Grant Program.

Enoxacin is an antibiotic medication that has been used to treat a variety of infections such as urinary tract infections (UTIs) and gastroenteritis (the stomach flu). Dr. Hornstein's team has gathered evidence from mouse models that suggests enoxacin can also help motor neuron pathways. This trial will examine the safety and efficacy of this medication in human participants with ALS.

"The enoxacin program highlights our cutting-edge capabilities. The entire program is based on breakthroughs in neuroscience demonstrating that DICER (enzyme) activity is key to the development and progression of ALS. Enoxacin is a known generic medication that has never been tried with ALS, but has specific biological reasons to be effective," explained Dr. Genge.

MINDFULNESS TO ENHANCE BRAIN HEALTH & QUALITY OF LIFE FOR INDIVIDUALS WITH ALS

In addition to clinical drug trials, The Neuro is examining non-pharmacologic therapies that may help to reduce psychological comorbidities in individuals with ALS. In collaboration with a team of eight multi-disciplinary and international investigators, Dr. Genge holds a second 2020 Discovery Grant examining mindfulness approaches to improving quality of life for those with ALS, as well as their caregivers.

From the moment that someone is diagnosed with ALS, there are changes to her or his capabilities and daily function. This can be extremely stressful, spurring a rollercoaster of emotions and feelings of helplessness. Caregivers also experience dramatic changes in their lives. As Moore from ALS Canada explained,

> **THOUGH CAREGIVERS ARE NOT EXPERIENCING PHYSICAL SYMPTOMS, THEY OFTEN EXPERIENCE SUSTAINED GRIEF AND LOSS OF THE RELATIONSHIP WITH THEIR LOVED ONE.**

Mindfulness training involves slowing down thoughts, becoming aware of emotional responses, and paying attention to sensations. Dr. Francesco Pagnini is a member of the multi-disciplinary team with Dr. Genge that was awarded the 2020 Discovery Grant. Dr. Pagnini recently conducted a randomized controlled trial of a five-week structured mindfulness program known as "Langerian Mindfulness," which involved 47 individuals with ALS and 27 caregivers.

Results of this study were published by Dr. Pagnini and his colleagues in early 2022 and provide preliminary evidence that mindfulness training increases quality of life for patients with ALS and their caregivers. Furthermore, data suggests that the effects of mindfulness training are enduring, with lower levels of depression and anxiety for those who received training at three- and six-month follow-up, compared to the participants in the control group.

Given that depression and anxiety symptoms are also common in mild cognitive impairment and dementia, mindfulness training may be a promising therapy for individuals with ALS and cognitive comorbidities.

The ongoing exploration of mindfulness at The Neuro builds upon Dr. Pagnini's pilot trial and aims to fill an important therapy gap by simultaneously addressing emotional states for patients, their caregivers, and clinic staff. Dr. Genge shared her enthusiasm for this new project and described the role that mindfulness may play as an ALS therapy.

> **WE HAVE COME TO REALIZE OVER THE LAST COUPLE OF YEARS JUST HOW IMPORTANT OUR SENSE OF SELF AND OUR SENSE OF THE WORLD IS TO OUR WELL-BEING. THIS IS TRUE WHETHER WE ARE OTHERWISE HEALTHY OR HAVE SERIOUS CONDITIONS LIKE ALS.**

Dr. Genge is hopeful for the future of ALS therapies and patient outcome. "I believe that we have started programs that are demonstrating true efficacy, and that these will only snowball. We will get to a point where ALS is a chronic disease that can be managed."

Langerian Mindfulness encourages individuals to purposefully pay attention to the present moment and to be open to multiple perspectives, new possibilities, and new information. This form of mindfulness may be particularly useful for patients with ALS because of its emphasis on reframing negative experiences, as well as its attention to (and acceptance of) the variability of circumstances.

Count on Me

THE HEALTH BENEFITS OF VOLUNTEERING

Volunteers play a critical role in maintaining community well-being and contributing to the overall Canadian economy. Approximately eight in ten Canadians aged 15 and over volunteered in 2018, either formally or informally, according to Statistics Canada's General Social Survey on Giving, Volunteering and Participating. Collectively, these volunteers donated time equivalent to more than 2.5 million full-time jobs that year.

→

The Conference Board of Canada estimated the economic contribution of volunteering in Canada to be valued at $55.9 billion in 2017. Volunteering rates are also high globally; the United Nations Volunteers Program reported in 2018 that the formal and informal global volunteer workforce equates to 109 million full-time jobs.

Clearly, the benefits of volunteering to society are significant. Perhaps less obvious, though, are the personal benefits for the volunteers themselves.

> **A GROWING BODY OF RESEARCH IS PROVIDING EVIDENCE THAT LINKS FORMAL VOLUNTEERING TO A WIDE ARRAY OF HEALTH AND WELL-BEING BENEFITS.**

In a recent study conducted by researchers from Harvard T.H. Chan School of Public Health in the U.S., led by Dr. Eric Kim and published in June 2020 in *American Journal of Preventive Medicine*, the researchers examined the associations between volunteering and 34 indicators of physical health, health behaviours, and psychosocial well-being. The researchers used data (both face-to-face interviews and survey responses) from nearly 13,000 participants from the Health and Retirement Study – a large, nationally representative sample of U.S. adults over 50 years of age.

The researchers found that compared to participants who did not volunteer during the four-year follow-up period, the participants who volunteered 100 or more hours per year enjoyed:

- 44% lower mortality risk;
- 17% lower risk of limitations to physical functioning;
- 12% increased likelihood of engaging in frequent physical activity;
- higher self-rated health; and
- better outcomes on some psychosocial well-being indicators (in particular, higher levels of positive affect, optimism, and purpose in life, and lower levels of depressive symptoms, hopelessness, and loneliness, as well as decreased likelihood of reporting lack of contact with friends).

No associations were found between volunteering and the many other health and well-being indicators that the researchers examined. This was inconsistent with findings from previous research that has found, for example, links between volunteering and reduced risk of hypertension, cardiovascular disease, and cognitive impairment.

Consistent with prior research, though, this study did find that many of the positive associations between volunteering and health/well-being effects were only evident among individuals who volunteered a minimum of 100 hours per year, suggesting that there may be a minimum threshold of volunteer time required to achieve the benefits.

Formal volunteering refers to unpaid, non-compulsory work performed through an organization (such as a hospital, school, or charity) to benefit others.

Informal volunteering refers to directly lending a hand to help family members (outside of one's household), friends, neighbours, or others, without working through an organization.

Both Statistics Canada and the United Nations report that informal volunteering is much more common than formal volunteering. In Canada, informal volunteering is almost twice as common. Globally, informal volunteering comprises approximately 70% of total volunteer activity.

"The results from our study were in line with some findings from previous research, but inconsistent in other ways. This was not as surprising as it may sound because the various studies on this topic have differed in many ways methodologically," explained Dr. Kim, now a Visiting Scientist in the Department of Social and Behavioral Sciences at Harvard T.H. Chan School of Public Health in the U.S. and an Assistant Professor of Psychology at the University of British Columbia.

> “
> **IN THE END, WE CONCLUDED THAT VOLUNTEERING APPROXIMATELY TWO HOURS EACH WEEK DOESN'T JUST BENEFIT THE COMMUNITY, IT ALSO HELPS OLDER ADULTS EXPERIENCE SOME IMPORTANT HEALTH AND WELL-BEING BENEFITS.**

More research is needed to fully understand the ideal type and "dose" of volunteering to maximize the positive effects. However, Dr. Kim envisions a day when volunteering will be an activity that physicians suggest to their willing and able patients as a simple and easily accessible wellness intervention.

COGNITIVE BENEFITS OF VOLUNTEERING

Although Dr. Kim and his colleagues did not find any association between volunteering and cognitive performance, other research has revealed that volunteering may provide cognitive benefits.

For example, a review conducted by Dr. Hayley Guiney and Dr. Liana Machado – published in March 2018 in *Journals of Gerontology: Psychological Sciences* – looked at the collective findings from 15 studies that each examined the relationship between formal volunteering and cognitive functioning, in participants aged 55 and over.

> *The researchers found evidence that suggests volunteering may protect against cognitive aging with respect to global functioning and some specific cognitive domains.*

Most of the cross-sectional studies showed significant positive (but small) associations between volunteering and global cognitive functioning, but it is important to note that cross-sectional research only reveals correlation between variables, not causation.

That means, it is possible that volunteering causes improvements in cognitive function, or that people with better cognitive function are more likely to volunteer, or that a different unidentified variable influences both volunteering and cognitive function. However, findings from studies that used other research methodologies did provide limited support for the notion that it could indeed be volunteering that leads to cognitive improvements.

Interestingly, the researchers also found some evidence that age may influence the relationship between volunteering and cognition, potentially indicating that the cognitive benefits of volunteering increase as one gets older. There were also indications that the cognitive benefits of volunteering might also be greater for individuals with impaired cognitive functioning.

In the end, the researchers concluded that the link between volunteering and some aspects of older adults' cognitive function appears promising, but more research is needed to determine how volunteering can best be used as an intervention to help reduce age-related cognitive decline.

VOLUNTEERING & COGNITIVE FUNCTION

It makes sense that volunteering has the potential to help with cognitive function given that, depending on the volunteer activity, it can involve cognitive stimulation, physical activity, and/or social interaction (three of the "six pillars" of brain health).

An even more recent example of research on the cognitive effects of volunteering among older adults was conducted by Dr. Sae Hwang Han and colleagues and published in May 2020 in *Social Science & Medicine*. In that study, the researchers used data from the U.S. Health and Retirement Study to examine whether formal volunteering was associated with cognitive benefits in later life, and whether volunteering could be an effective health intervention for preventing or delaying the onset of Alzheimer's disease.

Much of the existing research has compared the cognitive functioning of a group of volunteers to either a group of non-volunteers or groups who volunteered differing amounts of hours. This study, however, took a unique "within-person" approach, meaning that the researchers looked at data on an individual basis, examining each participant's level of cognitive functioning and rate of cognitive decline during times when that participant volunteered compared to times when she or he did not over a 16-year period.

After analyzing data from nearly 9,700 participants, the researchers found robust within-person associations between volunteering and higher levels of cognitive functioning, as well as slower rates of cognitive decline. Interestingly, they found that volunteering for any amount of time significantly forestalled cognitive decline, which contrasts with findings from earlier studies that suggested a minimum threshold of hours is needed to attain the benefits of volunteering.

Additionally, the cognitive benefits associated with volunteering were found to be more pronounced in the participants who were at higher genetic risk for developing Alzheimer's disease. According to Dr. Han, an Assistant Professor at University of Texas at Austin,

> **OUR FINDINGS SHOW THAT ENGAGING IN FORMAL VOLUNTEERING AS AN OLDER ADULT FOR ANY AMOUNT OF TIME APPEARS TO BENEFIT COGNITION.**

"For those with a genetic predisposition for Alzheimer's disease, though, it looks like there may be an optimal amount of volunteering hours to maximize the slowing of cognitive decline over time, between 100 and 199 hours per year. Perhaps volunteering less than 100 hours annually is an insufficient 'dosage' for meaningful shifts in the underlying biology for people with genetic risk. And, perhaps volunteering more than 200 hours annually creates life-balance conflict and stress, thus undermining the potential positive effects with respect to facilitating a gene-regulatory function." →

WHAT ASPECTS OF VOLUNTEERING CONTRIBUTE TO FAVOURABLE PSYCHOLOGICAL OUTCOMES?

Recently, researchers in Australia – Dr. Michelle Jongenelis and colleagues – conducted a study to explore which aspects of the formal volunteering experience predict improvements or declines in psychological outcomes in older adults over time. The study involved 108 Australian older adults (with an average age of 70) who were non-volunteers at the beginning of the study, and then engaged in six months of volunteering.

Participants completed various measures to assess psychological well-being at the beginning and the end of the six-month study period, and thereafter reported about their volunteering experience. Volunteer experiences that left participants feeling overwhelmed resulted in declines in subjective well-being and psychological resources. These outcomes were improved among those who reported that their volunteering fulfilled their desire to work for a cause that was important to them and provide the opportunity to engage in meaningful activities.

"Our study showed that some aspects of the formal volunteering experience contribute in positive ways to psychological outcomes in older adults, yet other aspects may be detrimental," said Dr. Jongenelis, a Senior Research Fellow at the University of Melbourne.

> **BASED ON OUR FINDINGS, WE RECOMMEND OLDER ADULTS SEEK VOLUNTEER OPPORTUNITIES THAT INVOLVE: (1) WORKING FOR A CAUSE THAT IS IMPORTANT TO THEM; AND (2) ENGAGING IN ACTIVITIES THEY BELIEVE TO BE MEANINGFUL.**

It is also important that the volunteer role is not overly burdensome as this can contribute to diminished well-being. "Sticking to these recommendations can boost the likelihood of experiencing favourable psychological outcomes." These findings were published in April 2021 in *European Journal of Ageing*.

In Your Trust

THE VALUE OF A TRUSTED CONTACT PERSON

With the ranks of older Canadians growing prodigiously and the rates of dementia set to skyrocket, a new regulatory measure has been adopted across the country to help protect the finances of vulnerable individuals. Financial advisors are now required to ask their clients whether they wish to provide the name of a "trusted contact person" that the advisors can contact if they have concerns about a client's financial exploitation or diminished mental capacity.

> **IT IS IMPORTANT TO EMPHASIZE THAT A TRUSTED CONTACT PERSON (TCP) IS NOT THE SAME AS, NOR MEANT TO REPLACE SOMEONE WHO HAS BEEN APPOINTED AS, A POWER OF ATTORNEY (POA).**

A POA has the authority to make financial decisions on an individual's behalf under certain circumstances, such as if she or he becomes incapacitated. A TCP, on the other hand, does not and will never have this authority (unless that person is also appointed as that individual's POA). While an individual could choose to have the same person perform both roles, firms like Royal Bank of Canada (RBC) recommend that their clients choose a TCP who is not involved with their financial decision-making process in order to create an additional layer of protection. Indeed, the TCP is someone who a financial advisor can reach out to if she or he feels that a POA is not acting appropriately.

The TCP should be someone who has earned your trust, who you communicate with on a regular basis, and who will act in your best interests. Depending on your specific instructions and circumstances, an advisor may contact your TCP to discuss concerns about your mental capacity to make financial decisions and/or to report suspicions of abuse or other concerns.

"It could be a suspicious transaction via e-mail, or it could be a health matter, or perhaps the advisor was trying to reach the client and couldn't contact her or him," said Tony Maiorino, Vice President and Director of Wealth Management Services at RBC. "It's an extra layer of protection."

Maiorino told Mind Over Matter® that RBC advisors have been explaining the concept of TCPs to their clients as a central part of their conversations about estate planning. Advisors will not disclose any personal information to the TCP about your financial accounts (unless specifically authorized to do so), nor are they required to make a diagnosis of someone who might be in cognitive decline.

"As financial advisors, we are not assessing someone's mental capacity. This is about being able to reach out to somebody to ensure the protection of the client and to highlight any concerns," explained Maiorino.

> **THE ROLE OF THE TCP IS SIMPLY TO RAISE RED FLAGS AND THE CLIENT IS FREE TO DECLINE IF SHE OR HE DOES NOT WISH TO NAME A TCP.**

The TCP initiative has been around for several years in the U.S. and some firms in Canada had already been recommending this practice as an additional safeguard for their clients. However, as of December 31, 2021, the Canadian Securities Administrators (CSA), the Investment Industry Regulatory Organization of Canada (IIROC), and the Mutual Fund Dealers Association of Canada now require financial advisors to take reasonable steps to have a client name a TCP as part of the enhanced "know your client" (KYC) process.

While recent data for Canada is difficult to find, the World Health Organization estimates that one in six older adults is the victim of elder abuse, with financial abuse being one of the most common forms.

And the situation has only worsened during the COVID-19 pandemic. Elder Abuse Ontario reports that since the beginning of the pandemic, there has been a 250% increase in calls to the Seniors Safety Line.

Laura Tamblyn Watts, CEO of the seniors' advocacy organization CanAge, believes that now more than ever, a conversation about naming a TCP is a critical part of the services provided by financial advisors.

"With the rise of elder financial abuse, a TCP provides an important second measure if there are worries of abuse or neglect or mental incapacity," she said.

If, for example, an advisor is concerned about a client's uncharacteristic behaviour or action but is unable to reach her or him, the advisor would then get in touch with the TCP.

"The financial advisor will start with basic information: 'Do you know where Sally is?' And the advisor may discover that Sally is hiking in the Himalayas and has indeed decided to purchase crypto currency overnight. The TCPs are a resource above all things - another way for the financial advisor to get a fuller picture of what's happening in that person's life."

> ***In other instances, the trusted contact person may visit the client's home to ensure that the client is not in any distress.***

Tamblyn Watts noted that only about one-third of Canadians have a POA, which means that for the other two-thirds of the population, a financial advisor has no one to contact at a time of concern.

The arrival of TCPs was welcomed by Advocis, the Financial Advisors Association of Canada, which describes itself as the largest voluntary professional membership association of financial advisors in Canada, representing more than 13,000 members.

President and CEO of Advocis, Greg Pollock, told Mind Over Matter® that advisors had been encountering situations where they had concerns about a client, but often no easy way of reporting them.

"TCPs are not only a good idea, but we also think it's necessary," he said.

However, Pollock believes that additional measures are needed to protect advisors who may be concerned that they might be threatened with litigation. Advocis is calling for a "legal safe harbour" provision, which would make it clear that an advisor could not be found liable merely because she or he contacted a TCP to raise concerns about a client.

> **ADVISORS WILL FEEL FREER TO INTERVENE ON THE CLIENT'S BEHALF IF THEY KNOW THAT THEY HAVE PROTECTION FROM LIABILITY.**

Tamblyn Watts suggests that TCPs should be part of a broader conversation about the role of financial planning in an aging society.

"Advisors need to get better at having conversations about difficult issues like family dynamics, death, mental capacity, abuse, neglect, substance abuse, and dependent adult children."

Pollock noted that the role of the financial advisor has changed dramatically in recent years. "Those kinds of soft skills, such as active listening, are more critical in working with clients today than it was in the past," he said. "There are many people who believe that this is an industry that's only about buying and selling. It's much more than that, much more wholistic. It's now understanding the client's entire situation."

In Canada, there is a vast amount of money at stake. Baby boomers are considered the wealthiest generation in human history. According to a 2017 survey conducted by RBC, approximately CDN$400 billion is expected to be transferred from one generation to the next in the upcoming years. If you include the U.S. and the U.K., the number grows to an astonishing US$4 trillion.

The arrival of the TCP initiative happened to coincide with the pandemic, a time in which increasing concerns about our mortality seemed to have sparked greater interest in financial planning.

According to Maiorino, RBC's estate planning division saw requests for meetings rise approximately 30% in 2020 and approximately 26% in 2021. "Whether it's a growing awareness on the heels of the pandemic or an abundance of caution, people just seem to be saying we need to get this squared away."

Maiorino noted that advisors are using the introduction of the trusted contact person rules as an opportunity to have broader conversations with their clients about related issues such as powers of attorney and elder care – all elements of the life journey that require attention as we age.

Filled with Sorrow

PROLONGED GRIEF'S IMPACT ON BRAIN HEALTH

When a loved one passes away, grief is a natural response. What characterizes grief is the focus on the person who died – yearning, longing, and insistent thoughts and memories. Feelings of grief are accompanied by a variety of other psychological and physiological symptoms that vary from loss to loss, and over time within a loss.

During the period of acute grief (a term that researchers use to describe the short-term, early part of the grieving process), people often experience a range of emotions, including sadness, anxiety, guilt, and anger. Positive emotions like affection, pride, and amusement are interspersed with the painful ones.

GRIEVING CAN BE ASSOCIATED WITH PHYSIOLOGICAL CHANGES, INCLUDING INCREASED BLOOD PRESSURE AND CORTISOL LEVELS, DIFFICULTY SLEEPING, AND IMMUNE SYSTEM CHANGES, CONTRIBUTING TO MANY NEGATIVE HEALTH OUTCOMES, INCLUDING INCREASED RATES OF MORBIDITY AND MORTALITY.

After most losses, intense feelings of grief and any resulting life disruption will gradually diminish, and grief will recede into the background where it is integrated into the person's life within weeks or months. Beyond that, many people still experience the reappearance of noticeable grief on certain milestones or other special occasions (e.g., anniversary of the death, birthdays, and/or family holidays). This is not an indication that the person has not dealt with the loss, though. It is a good idea to plan for these challenging times to minimize the pain, perhaps taking time to honour and remember the deceased on those days.

Thankfully, most of the health risks linked with acute grief are temporary, and as the initial intense grief subsides, the physiological changes follow suit (typically by about six months after the loss). However, a minority of grieving individuals will develop "prolonged grief disorder" and experience continued severe distress and impairment, along with negative health impacts, which can last for several years after the death.

Approximately 10-20% of bereaved adults who lose a spouse or serious romantic partner experience prolonged grief disorder.

Prolonged grief disorder is even more prevalent among adults who lose a spouse than among parents who have lost a child or in cases where a death is sudden or violent. It tends to be less common after losing a parent, grandparent, sibling, or close friend.

The concept of **prolonged grief** as a disorder was developed in the 1990s, along with the development of criteria to identify it clinically. Other terms that have been used for prolonged grief disorder include complicated grief, complicated grief disorder, chronic grief, complex grief, traumatic grief, unresolved grief, pathological grief, and persistent complex bereavement disorder.

PROLONGED GRIEF DISORDER & COGNITIVE FUNCTION

A study conducted by Dr. Heidi Saavedra Pérez and colleagues analyzed data from 5,501 individuals who were part of the Rotterdam Study (an ongoing study since 1990 in the Netherlands involving a cohort of approximately 15,000 participants aged 45 and over). Participants were divided into three groups: (1) individuals experiencing no grief; (2) individuals experiencing normal grief; and (3) individuals experiencing complicated grief.

All participants completed a battery of cognitive tests and underwent magnetic resonance imaging (MRI) brain scans. The researchers reported in 2015 in *Psychological Medicine* that, compared to either the normal grief or no grief groups, participants with complicated grief performed measurably worse on the cognitive tests (specifically, tests of executive function and information processing speed), though the differences were small.

Those with complicated grief also had lower total brain volume, for both white and grey matter. There were no differences found in cognition or brain structure between participants in the normal grief group and those in the no grief group.

It is important to note that because of the study design used, it is unknown whether the associations that the researchers found are causal. In other words, it is not clear if complicated grief causes lower cognitive performance or brain atrophy. It is possible that the reverse may be true - i.e., lower cognitive performance or brain atrophy may reflect a vulnerability to developing complicated grief.

Or perhaps another variable (like poor self-care or nutritional deficiencies) contributes to complicated grief, lower cognitive performance, and/or brain atrophy. These were preliminary findings, and more research is needed to fully understand the impact of complicated grief on brain structure and cognitive function.

Dr. Saavedra Pérez and colleagues conducted another study (this one published in 2018 in the *American Journal of Geriatric Psychiatry*) looking at prolonged grief and cognitive decline in middle-aged and older adults. Once again, the researchers examined data from participants who were part of the Rotterdam Study – in this case, 3,126 individuals in total who were studied over a seven-year follow-up period to observe changes in cognitive performance over time.

ON AVERAGE, THOSE WITH PROLONGED GRIEF DISORDER SHOWED MORE COGNITIVE DECLINE OVER THE SEVEN-YEAR PERIOD, COMPARED TO PARTICIPANTS IN THE NO GRIEF GROUP.

There was no difference in rates of cognitive decline between the no grief group and the normal grief group. These results demonstrate →

that prolonged grief is a potential risk factor for cognitive decline, but this does not mean that everyone with prolonged grief disorder will experience problems with cognitive functioning.

TREATMENT FOR PROLONGED GRIEF DISORDER

When grieving, it is essential to take care of your mental and physical health, and to decrease stress in the usual ways (e.g., eat well, get enough sleep, and exercise). Consider accepting or asking for help with household and family responsibilities, taking time off work, and/or seeking informal support from family and friends, as well as formal support if necessary (e.g., from support groups and/or individual counselling).

Be patient and understand that it takes time to come to terms with a loss, and just how much time will vary by individual and circumstance. However, if your grief is intense and does not feel like it is improving after at least six months, you may be experiencing prolonged grief disorder, and could benefit from specialized therapy.

Dr. Katherine Shear, the Founding Director of the Center for Prolonged Grief at Columbia School of Social Work in the U.S., led the development of such a specialized therapy known as "Prolonged Grief Disorder Therapy." The treatment is a short-term intervention, typically delivered in 16 sessions.

> ***Prolonged Grief Disorder Therapy (PGDT) has been extensively tested in robust studies that have found it to be superior to standard individual psychotherapy for depression, as well as antidepressant medication.***

During those sessions, a trained therapist guides participants through seven "healing milestones" as pathways to adapt to the loss: understanding grief, managing emotions, seeing a promising future, strengthening relationships, narrating the story of the death, learning to live with reminders, and connecting with memories of the person who passed away. In addressing these milestones, the therapist also aims to help participants address "stuck points" that are interfering with the process of adapting.

Approximately 70% of the study participants, all of whom had been suffering for years or even decades with prolonged grief, were much improved after only four or five months of treatment.

More information about this treatment, as well as a search tool to help you find a therapist who is trained to deliver it, can be found on the Center's website: https://prolongedgrief.columbia.edu. (There is a brief grief questionnaire that you can complete to help you determine if you might be experiencing prolonged grief, as well as information about training opportunities for therapists interested in PGDT.)

"Prolonged grief disorder is different from depression, which is why prolonged grief benefits from a specialized treatment approach," explained Dr. Shear. "Without treatment, symptoms of prolonged grief diminish slowly and may persist, having an ever-greater negative impact on your health as time goes on."

If you think that you are experiencing prolonged grief, then it is critical to seek help. "There are an increasing number of therapists trained in doing PGDT. What is essential is that you find a therapist who understands prolonged grief disorder and can provide psychotherapy that focuses on accepting the loss and restoring the capacity for well-being through reconnecting with genuine personal interests and core values, a sense of competence, and a feeling of belonging and mattering. If depression is also present, antidepressants are helpful, but it is important that there is accompanying therapy addressing the loss."

Under Your Nose

PROTECTION BY NASAL VACCINE

Researchers continue to explore nasal sprays as a mechanism for delivering treatments and vaccines because nasal tissues are thin, and molecules are easily absorbed into the bloodstream with little pain and discomfort. Nasal sprays offer a non-invasive and easy-to-administer alternative for children and others who are averse to needles and/or the taste of oral medications (like liquids and pills). →

Nasal vaccines are also advantageous from an environmental standpoint, as they generate less medical waste than needles and vials, as well as eliminate the need for regulated disposal. They may also offer an economic advantage, as health care professionals are typically not required to administer doses (thereby allowing individuals to manage their treatments from the comfort of their own homes), and temperature-sensitive storage systems may not be needed if dry powder formulations are used.

Some evidence suggests that nasal vaccines may cause milder side effects when compared to intramuscular injections (i.e., needle into muscle).

Others report similar side effects as their intramuscular counterparts. Many people have positive perceptions of nasal sprays, especially if they are used for treating and preventing respiratory diseases. It seems logical that the medication is injected directly into a key site of infection and transmission (namely, the nose).

If targeted delivery into the nasal cavity can trigger mucosal antibodies in the lining of the nose (in addition to circulating antibodies in the blood), then this could potentially mount an attack on the virus at the site of exposure and prevent spread. In contrast, traditional systemic vaccines delivered through intramuscular injection only produce antibodies in the bloodstream that then circulate and mount an attack when the virus enters the bloodstream.

Although there appears to be many advantages to intranasal vaccines (especially when pitted against intramuscular injections), this type of vaccine development is not without its challenges. A nasal spray needs to stimulate an immune response in sensitive nasal tissues without triggering an infection that leads to illness. It may also not confer long-lasting protection nor be significantly cheaper to develop and produce compared to other modes of vaccine delivery, which are key considerations for use in low- and middle-income countries.

Nanobodies are a smaller form of antibodies. Because of their smaller molecular size, they can be administered by nasal spray.

INFLUENZA NASAL VACCINE

The most well-known example of a nasal vaccine is FluMist for influenza (the flu). FluMist has been approved and available for those between the ages of two and 49 in the United States since 2003, and in Canada since 2010, and has since been distributed around the world.

Even so, there has not been an obvious uptake of seasonal vaccination against the flu since FluMist hit the market. A study conducted by Dr. Ève Dubé and colleagues published in April 2015 in *Human Vaccines & Immunotherapeutics* suggests that the novelty of a nasal spray vaccine leads to doubts about its effectiveness when compared to well-established vaccine administration by needle.

Emerging research specific to influenza suggests that intranasal vaccines may offer better short-term and broader protection compared to intramuscular injections.

A study conducted by Dr. Ji Eun Oh and colleagues published in *Science Immunology* in December 2021 compared the immune responses of mice receiving an influenza vaccine by either intranasal spray or intramuscular injection.

This research was a collaboration between the Yale School of Medicine and Icahn School of Medicine at Mount Sinai in New York. The results showed that only the antibodies from the intranasal vaccine – and not the circulating antibodies from the injection – led to protection in the respiratory mucosa and lungs. The localized protection from the intranasal vaccine was also better at defending against different strains of influenza when compared to the intramuscular injection.

Taken together, this meant that mice with the nasal vaccine had a better first-line of defense against the flu, directly in their nose. If this holds true for humans as well, this could significantly dampen the spread of the seasonal flu.

DEVELOPING NASAL SPRAYS AS A TREATMENT FOR COVID-19

A nasal spray developed from tiny llama antibodies is currently being studied at the Rosalind Franklin Institute in the United Kingdom to treat coronavirus disease 2019 (COVID-19). Researchers injected a protein from severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) into a llama, triggering an immune response of nanobodies.

These nanobodies were extracted and shown to effectively neutralize the original SARS-CoV-2 virus, as well as alpha and beta variants in a laboratory setting. If the human trials prove successful, then the nasal spray therapy may ultimately play an important role in the treatment and/or prevention of COVID-19.

Another group of researchers – Dr. Huibi Cao and colleagues from the University of Toronto – recently published data in *Cell and Bioscience* in December 2021 showing that an intranasal spray vaccine in mouse models not only elicited an immune response in nasal mucous membranes (like the research involving llama nanobodies), but also a systemic response (i.e., circulating antibodies).

This research examined helper-dependent adenoviral vaccines (HD-Ad) delivered by intranasal spray. The AstraZeneca and Janssen (Johnson & Johnson) COVID-19 vaccines (approved for use in many countries, including Canada) are also adenoviral vaccines, but they must be administered by intramuscular injection.

Additionally, human and animal models of intramuscular adenoviral have found that the virus is sometimes detected in the upper airways the day after exposure. SARS-CoV-2 in the upper airways can easily aerosolize and spread with a cough or a sneeze, putting others at risk of contracting COVID-19.

Dr. Cao and colleagues found that the HD-Ad nasal vaccine stimulated an immune response in mice by producing proteins and then antibodies to neutralize the virus. Protection was seen at the site of inoculation in the upper respiratory tract (e.g., nose and throat) and circulating throughout the body.

In this way, HD-Ad stopped unwanted adenoviral proteins from SARS-CoV-2 from replicating and infecting the mice the next time that they were exposed to the virus. This meant that the vaccine prevented infection and eliminated transmission. Moreover, even one day after exposure, the virus was not present in the upper respiratory tract or lower respiratory tract (lungs) of vaccinated mice.

These findings hold promise for constructing intranasal spray vaccines that may be used in clinical trials with humans, with the possibility of conferring greater protection for the vaccinated individual and reducing spread after exposure to SARS-CoV-2.

Data also suggest that HD-Ad nasal vaccines may confer good protection against different strains of virus, as opposed to their current intramuscular counterparts that have shown decreased protection against ever-present mutating strains of SARS-CoV-2.

NASAL VACCINE CLINICAL TRIAL FOR TREATING ALZHEIMER'S DISEASE

Nasal vaccines and treatments appear to be promising to combat respiratory illnesses, but what about other diseases where access through the nose may be beneficial? As it turns out, intranasal sprays may offer better access to the brain.

The Brigham and Women's Hospital in Boston, Massachusetts, will soon begin a Phase 1 clinical trial that examines the safety and effectiveness of using a nasal vaccine, Protollin, to slow down changes in the brain from Alzheimer's disease (AD). ⟶

While we typically think of vaccines as a mechanism to prime the body's defense system against infectious diseases (like influenza and COVID-19), vaccines are also helpful to prepare the body to fight against non-infectious molecules, like misfolded proteins.

AD is characterized by misfolded proteins in the brain: clumps of beta-amyloid protein (beta amyloid plaques) and tangles of tau protein (neurofibrillary tangles). A large body of evidence suggests that beta-amyloid plaques trigger the tau protein tangles, though some research suggests that tangles may precede plaque formation.

Nevertheless, when the immune function of macrophages (a type of scavenger white blood cell) and microglia (specialized scavengers in the brain and spinal cord) do not clear waste and unwanted debris, beta-amyloid plaques accumulate. In the Protollin trial, 16 participants between the ages of 60 and 85 diagnosed with early to mild AD with amyloid plaques (via brain imaging) will be recruited from the hospital's Ann Romney Center for Neurologic Diseases. The trial will use Protollin to target and stimulate the immune system to clear unwanted plaques in the brain.

This approach to stimulate the immune system is different from other AD vaccines currently in clinical trials. In other AD vaccine trials, the goal is to target misfolded proteins (beta-amyloid or tau proteins) with antibodies and to treat patients in various stages of AD, using other delivery systems like oral, injection, and intravenous rather than a nasal spray.

The trial will involve two doses of Protollin in the nose, two weeks apart. The goal is to identify the highest dose of Protollin that can safely stimulate the desired immune response.

It is anticipated that the nasal spray will help to deliver Protollin to the brain so that the immune system – the microglia – can prevent plaques from forming, as shown in studies with young mice, and decrease the accumulation of plaques to improve memory, as shown in studies with aged mice.

"It is encouraging to see new pathways and mechanisms explored for treating Alzheimer's disease," said Dr. Aleksandra Szabla, a palliative care physician in Scarborough, Ontario. "A vaccine given early in the course of disease could meaningfully enhance and extend quality of life for patients. Plus, if we can devise tests to detect plaques as soon as they start to accumulate when people are in their thirties and forties, a vaccine may form part of the prevention strategy for Alzheimer's disease."

> **PROTOLLIN HOLDS PROMISE AS A VACCINE BECAUSE PLAQUES ARE KNOWN TO OCCUR A DECADE OR MORE BEFORE THE ONSET OF SYMPTOMS.**

If effective, future treatment with Protollin could mean that plaques are cleared before obvious signs of AD manifest, like memory loss and cognitive decline. There is also the possibility that the Protollin vaccine may be used in conjunction with other AD treatments, to target the disease using multiple mechanisms.

Overall, the future of treatments and vaccines for respiratory and brain-related diseases may very well involve intranasal delivery. So long as nasal sprays are shown to be safe and effective, you may prefer a spray over a jab, or at least take comfort in knowing that you and your loved ones have options.

Over the Rainbow

THE IMPORTANCE OF A COLOURFUL DIET

Although there is ongoing debate and ever-shifting fads related to what constitutes a "healthy" diet, there is a clear and consistent consensus on the importance of consuming plenty of fruits and vegetables. ⟶

Phytonutrients, also referred to as phytochemicals, are compounds produced by plants. Colourful fruits and vegetables are phytonutrient-rich, but so are other plant-based foods, including tea, legumes, nuts, whole grains, herbs, and many spices. There are thousands of different phytonutrients, categorized into phyton groups, including carotenoids, curcuminoids, flavonoids, phytoestrogens, and sulfides. For example, there are more than 600 types of carotenoids alone – the phytonutrient that gives plants their yellow, orange, and red pigments.

Extensive research over many decades suggests that one's intake of fruits and vegetables is linked with lower risk of many chronic diseases, including cardiovascular disease, certain types of cancer, diabetes, and dementia. Increased consumption of fruits and vegetables has also been linked to numerous psychological benefits, including improved happiness, life satisfaction, well-being, and creativity, as well as lower prevalence of psychological distress.

Fruits and vegetables contain fibre and a wide range of vitamins and minerals. They also contain phytonutrients, which are the compounds that give plants their unique flavours and aromas, as well as their colours.

> ***By eating a wide assortment of coloured fruits and vegetables, often referred to as "eating the rainbow," your body takes in a variety of phytonutrients, each adding nutritional value to your diet in different ways.***

For example, phytonutrients may be anti-microbial, antioxidant, anti-inflammatory, anti-allergic, anti-spasmodic, neuroprotective, and more. Intake of certain phytochemicals has even been linked with decreased mortality.

PHYTONUTRIENT-RICH PLANT FOODS & COGNITION

Researchers in Italy conducted a systematic review of the available research on the effects of antioxidant-rich plant foods on cognition. Thirty-one studies of varying designs were included, involving participants of varying ages, including cognitively healthy individuals, as well as people with mild cognitive impairment (MCI) and dementia.

Seven of the studies reviewed showed significant improvements in all cognitive domains examined, and 19 found significant improvements in select cognitive domains or for just a subset of certain foods. The remaining five studies found either no significant cognitive improvement or no effectiveness.

> **OVERALL, WE FOUND THAT THE IMPACT OF DIETARY PLANT ANTIOXIDANTS ON COGNITIVE FUNCTION WAS PROMISING, WITH MOST OF THE STUDIES WE REVIEWED SHOWING SIGNIFICANT BENEFICIAL EFFECTS OF ANTIOXIDANT-RICH PLANT FOODS ON COGNITION.**

Dr. Luciana Baroni, lead author of the study and Founder and President of the Scientific Society for Vegetarian Nutrition, further explained that in some cases, "the effects were global and in others they affected specific cognitive domains. It's important to note that the positive cognitive effects found cannot be attributed just to the antioxidant properties. Plant foods contain thousands of different phytonutrients responsible for various important activities in the body, sometimes acting synergistically. That's potentially why many research studies that have administered 'isolated' plant antioxidants as supplements, instead of the whole plant food, have failed to prevent chronic diseases. It looks like the well-orchestrated activities of phytochemicals in whole plant foods cannot be replaced by extracted phytochemicals." These findings were published in May 2021 in *Antioxidants*.

PHYTONUTRIENT INTAKE & WOMEN'S MENTAL HEALTH

A different group of researchers looked at the association between consumption of phytonutrient-rich foods and mental health in 488 Iranian women between the ages of 20 and 50. They used a metric called the "dietary phytochemical index" (DPI) to quantify the amount of phytochemical intake.

After controlling for potential confounding variables, the researchers found that women with DPI scores in the top-third had significantly lower prevalence of depressive symptoms, anxiety, and psychological distress than the women in the bottom-third.

> **THE ASSOCIATION BETWEEN DPI AND MENTAL HEALTH IN WOMEN WAS FOUND TO BE STRONG, WITH THE HIGHER A WOMAN'S INTAKE OF PHYTONUTRIENT-RICH FOODS, THE BETTER HER MENTAL HEALTH.**

These findings add to the growing body of research that suggests that diets high in phytochemical-rich plant foods can protect health and, in this case, mental health specifically. These findings were published in May 2019 in *British Journal of Nutrition.*

BENEFITS BY COLOUR

Each individual fruit and vegetable has numerous effects depending on its phytonutrients and other components. However, there are some general patterns of benefits found in fruits and vegetables of similar colours because each colour corresponds with certain phytonutrient content.

For example, orange fruits and vegetables contain beta-carotene, while green indicates the presence of chlorophyll. Below you will find a summary of some of the known benefits for each colour. (Keep in mind, though, that there may be many additional benefits that are not described below or that perhaps have not yet been discovered or scientifically proven.) ⟶

RED fruits and vegetables - including tomatoes, cherries, strawberries, raspberries, cranberries, red apples and pears, watermelon, red grapes, blood oranges, pink grapefruit, radishes, red beets, red bell peppers, red cabbage, red onions, and red potatoes - tend to be high in phytonutrients with antioxidant, anti-inflammatory, and immune-modulating effects. Research has linked one of the phytonutrients found in red fruits and vegetables, lycopene, with protection against prostate cancer and heart and lung disease.

GREEN fruits and vegetables - such as spinach, kale, asparagus, broccoli, alfalfa sprouts, green cabbage, kiwi, avocados, and Brussels sprouts - are rich in cancer-blocking phytonutrients like sulforaphane and indoles.

ORANGE & YELLOW fruits and vegetables - including carrots, oranges, sweet potatoes, yellow peppers, pineapple, mango, pumpkin, apricots, peaches, cantaloupe, and winter squash - often contain beta cryptothanxin, a common carotenoid, which supports communication between cells in your body and may help prevent heart disease.

BLUE & PURPLE fruits and vegetables - including blueberries, blackberries, purple grapes, purple cabbage, eggplant, plums, figs, and prunes - contain anthocyanins, powerful antioxidants that have been linked to delayed aging of cells, as well as support for heart health through blocking blood clot formation.

WHITE & BROWN vegetables - like onions, garlic, leeks, cauliflower, parsnips, and mushrooms - contain important phytonutrients. For example, allicin is found in the onion family and has anti-tumor properties. Other white vegetables contain flavonoids with antioxidant properties, such as quercetin.

ARE YOU EATING ENOUGH FRUITS & VEGETABLES?

Both the *2019 Canada's Food Guide* and *The Dietary Guidelines for Americans (2020-2025)* emphasize the importance of consuming fruits and vegetables, recommending that combined they should make up approximately half of your total "plate" each day. The ideal quantity varies for each person, depending on age, sex, height, weight, and physical-activity level. For example, the U.S. Dietary Guidelines recommend that people on a 2000-calorie diet should eat two and a half cups of vegetables and two cups of fruit each day.

Unfortunately, research shows that fruit and vegetable intake among Canadians is consistently low (and decreasing over time), with most Canadians not meeting national recommendations. The same is true for Americans.

The following are some tips to help you maximize the benefits of phytonutrients in your diet:

- Set a goal for the amount of fruits and vegetables that you will eat each day. You can use the U.S. Department of Agriculture (USDA) website, www.myplate.gov/myplate-plan, to find out your personalized food group target amounts.
- Aim to eat a wide variety of plant foods, including fruits and vegetables. Some nutrition experts suggest challenging yourself to eat 50 unique plant foods each week.
- Track your intake of phytonutrient-rich foods, noting each unique plant food consumed every day for one week on a tracking sheet, to see if you are achieving your goal.
- Eat the skins! Do not just eat the inner, paler flesh of your fruits and vegetables. Instead, avoid peeling when you can because much of the phytonutrients are contained in the skins.

The **dietary phytochemical index (DPI)** represents the percentage of energy intake derived from foods rich in phytochemicals, including fruits and vegetables, as well as other plant-based foods like nuts and legumes. Studies have found that the DPI is inversely linked with obesity, elevated cholesterol and blood pressure, insulin resistance, prediabetes, and breast cancer.

Rosemary Socca

MAKES 4 PANCAKES

INGREDIENTS

- 4 cups (1 L) chickpea flour
- 4 cups (1 L) water
- 1/3 cup (75 mL) extra-virgin olive oil, plus more for greasing the skillet
- 1 tablespoon (15 mL) sea salt
- 2 teaspoons (10 mL) chopped fresh rosemary flaky sea salt
- Full-fat ricotta cheese (optional)
- A glass of rosé wine (optional)

INSTRUCTIONS

In a large bowl, add the chickpea flour, water, olive oil, salt, and rosemary. Stir to combine. You should be left with a thick batter resembling pancake batter. Cover and chill for 30 minutes in the fridge.

Preheat the broiler to high. Generously grease the bottom of a 12-inch (30 cm) oven-safe skillet or cast-iron pan with olive oil. Place it in the oven and allow it to heat up until almost smoking, about 6 minutes. Using a ladle, place 1 1/2 cups (375 mL) of the batter into the pan and swirl it around. Use a spoon to help you smooth the batter out until it covers the bottom of the pan. Broil for 4 to 5 minutes, until golden and crispy. Slide the pancake onto a clean plate and repeat with the remaining batter.

Before serving, garnish each piece of socca with a sprinkle of sea salt and a dollop of ricotta, if using. Enjoy with a glass of rosé wine to complete the experience.

Chickpea

Chickpeas are loaded with magnesium, fibre, and protein, and are a great source of choline to keep your brain healthy.

MEMORY**MORSELS**®

A WOMEN'S BRAIN HEALTH INITIATIVE

This edition's recipes are courtesy of Suzanne Barr, cookbook author, restauranteur, judge on Food Network Canada's series, Wall of Chefs, and one of North America's most respected chefs.

For more recipes and the latest from our Featured Foodie, **Suzanne Barr**, visit memorymorsels.org.

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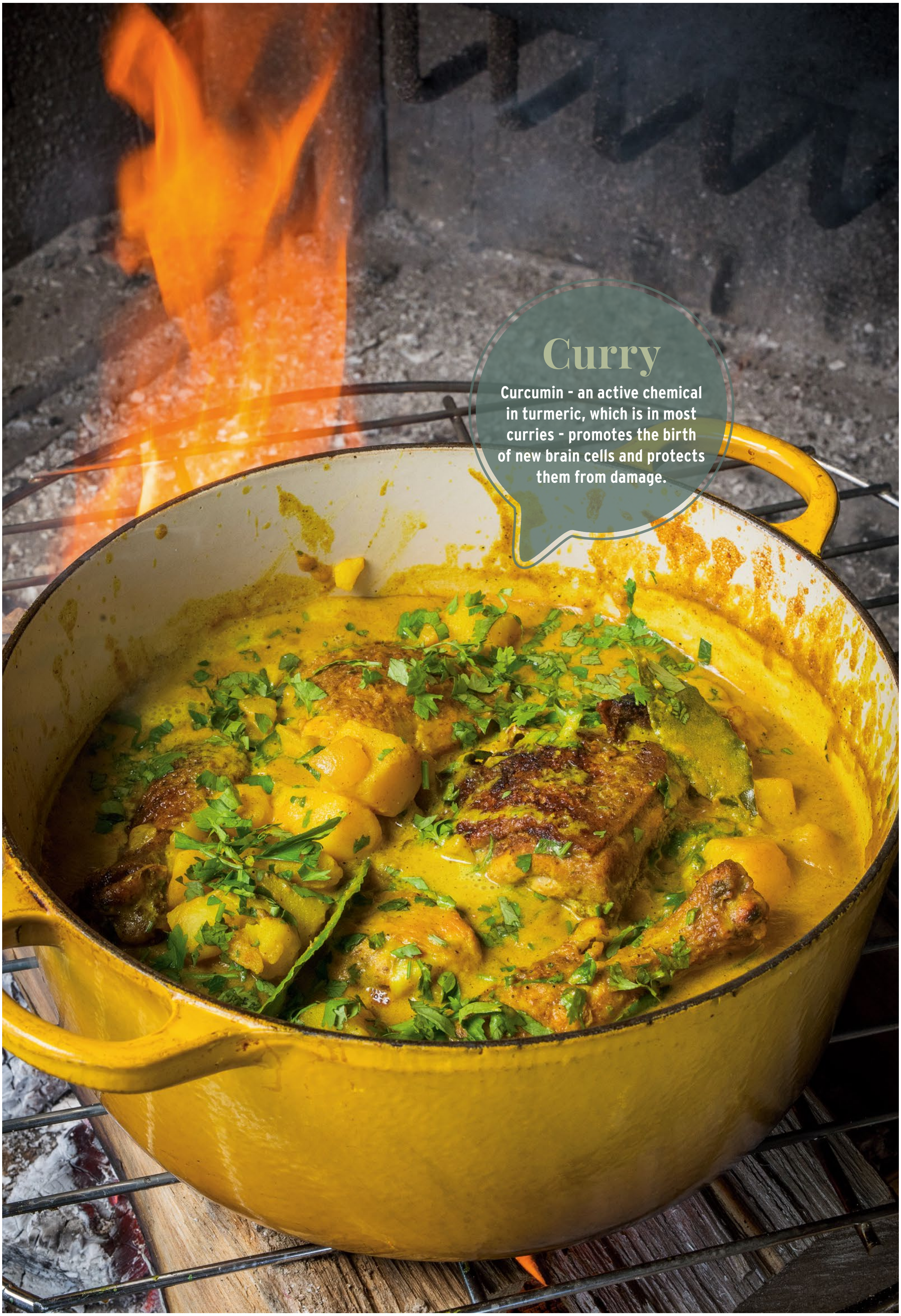

Curry

Curcumin – an active chemical in turmeric, which is in most curries – promotes the birth of new brain cells and protects them from damage.

100K Curry Chicken

SERVES 4

INSTRUCTIONS

Make the Curry Spice Mix: In a medium dry skillet over high heat, toast the coriander, cumin, allspice, mustard, fenugreek, peppercorns, and clove for 2 to 4 minutes, until fragrant. Remove from the heat and let cool for 2 minutes. Transfer the spice mix to a spice grinder, mortar and pestle, or to a high-speed blender. Grind to a powder. Transfer the powder to a small bowl. Add the turmeric, ginger, nutmeg, cinnamon, and cayenne. Stir to combine. Set aside.

Make the Curry Chicken: Trim off any excess fat from the chicken. Cut each chicken quarter into 3 equal pieces and place them in a large bowl. (Using a serrated knife can be helpful for this, particularly on the skin.) Add the curry spice mix, garlic, onion, olive oil, and salt. Use your hands to massage the mixture into the chicken pieces until they are evenly coated. Cover the bowl with plastic wrap and place the chicken in the fridge to marinate for at least 4 hours, or overnight.

Remove the chicken from the fridge. Place the canola oil in a large saucepan over medium-high heat. Add enough of the chicken (and the onions and garlic) to cover the bottom of the pot. Cook until the chicken is browned on all sides, 5 to 7 minutes. Transfer the chicken to a clean bowl. Repeat until all of the chicken has been browned.

In the same saucepan you used to brown the chicken, add the chicken stock, bay leaves, Scotch bonnet, and chicken pieces. Bring to a boil over high heat. Reduce the heat to low and let simmer, uncovered, for at least 35 minutes, or until the chicken is completely cooked and beginning to fall off the bone.

While the curry is simmering, place the potatoes in a medium stock pot. Fill the pot with water to cover the potatoes by at least 2 inches. Place the pot over high heat and bring to a boil. Reduce the heat to low and let simmer for 15 minutes, until tender. Drain.

Add the coconut milk to the saucepan with the chicken and stir to combine. Let simmer for an additional 10 minutes. Add the potatoes. Stir to combine. Add salt and pepper to taste.

Toast the Cashews: Preheat a medium skillet over medium-high heat. Add the cashews and give the skillet a shake to ensure they're arranged in a single layer. Toast for 3 to 5 minutes, stirring constantly, until the nuts are golden brown and fragrant. Immediately transfer the nuts to a medium bowl to cool.

Just before serving, remove the bay leaves and the Scotch bonnet from the curry chicken and discard. To serve, place 1/2 cup (125 mL) steamed rice in each bowl. Ladle the curry overtop. Garnish each serving with some toasted cashews, toasted coconut, fresh cilantro, and mango chutney, if desired.

INGREDIENTS

CURRY SPICE MIX

+ 1 tablespoon (15 mL) coriander seeds
+ 1 tablespoon (15 mL) cumin seeds
+ 2 teaspoons (10 mL) whole allspice
+ 2 teaspoons (10 mL) yellow mustard seeds
+ 2 teaspoons (10 mL) fenugreek seeds
+ 1 1/2 teaspoons (7 mL) black peppercorns
+ 1 whole dried clove
+ 2 1/2 tablespoons (37 mL) turmeric
+ 2 teaspoons (10 mL) ground ginger
+ 1 teaspoon (5 mL) ground nutmeg
+ 1 teaspoon (5 mL) ground cinnamon
+ 1/2 teaspoon (2 mL) cayenne pepper

CURRY CHICKEN

+ 3 pounds (1.35 kg) chicken quarters
+ 1/2 cup (125 mL) curry spice mix 4 cloves garlic, smashed
+ 1 large yellow onion, diced
+ 2 teaspoons (10 mL) extra-virgin olive oil
+ 2 tablespoons (30 mL) kosher salt
+ 1 tablespoon (15 mL) canola oil
+ 3 cups (750 mL) chicken stock

+ 2 bay leaves
+ 1 whole Scotch bonnet pepper, any colour
+ 4 Yukon Gold potatoes, peeled and diced
+ 2 cups (500 mL) canned coconut milk
+ Salt and pepper

+ 2 cups (500 mL) steamed white basmati rice, to serve

FOR GARNISH (OPTIONAL)

+ 1 cup (250 mL) toasted cashews
+ 1/2 cup (125 mL) toasted unsweetened coconut flakes
+ Fresh cilantro leaves and stems
+ Mango chutney

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