$5.95

WBHI.ORG

Mind Over Matter®

VOLUME 19

HELPING YOU PROTECT YOUR BRAIN HEALTH

Listen to *the Children*

Menopause Brain is Real

THE MANY Faces of *Dementia*

Advancing Women's MENTAL HEALTH

Intimate Partner *Violence*

Multivitamins *& Brain Aging*

Women's Brain Health Initiative

Bold Science for Brain Health

In this edition, Mind Over Matter® highlights important research efforts funded by Brain Canada and our partners and donors, to tackle some of the most complex and perplexing brain health issues affecting women.

Bold Research Projects for Advancing Women's Mental Health, which begins on page 48, describes a $3.3-million investment from Brain Canada, the Krembil Foundation, and Women's Brain Health Initiative in three basic research projects that will lay the groundwork for future clinical studies.

One project probes how obesity and insulin levels can change the brain, and how these changes may be linked to depression and anxiety in women. A second study looks at the triggers, biomarkers, and treatments for postpartum depression, which impacts up to 20% of birthing parents and their children.

And a third study focuses on major depressive disorder – much more prevalent in women than men – and the development of a brain imaging tool to gain insights that will advance drug discovery.

Beginning on page 61, in the article *Intimate Partner Violence & Brain Injury: Understanding the Hidden Consequences*, readers will learn how research teams, funded through our targeted innovation grants, are studying ways to better diagnose and treat traumatic brain injury (TBI) caused by intimate partner violence. A heartbreaking and common condition, TBI leads to life-changing physical, mental, and societal consequences. I urge readers to learn about some of the hidden challenges of TBI, and to discover new approaches providing promise for women and children.

Although just a sampling of the inspiring work underway to advance women's brain health, these projects clearly illustrate Brain Canada's commitment to research that considers sex and gender differences, while improving health for all.

Our work is made possible by the Canada Brain Research Fund (CBRF), an innovative arrangement between the Government of Canada (through Health Canada) and Brain Canada.

We are deeply grateful for our partnerships with the Government of Canada and Women's Brain Health Initiative. Together, we look forward to making meaningful contributions to advancing brain health for all Canadians.

Sincerely,

Viviane Poupon, PhD
President & CEO
Brain Canada

Editor-in-Chief

As we embark on another enlightening journey together through the pages of our magazine, I'm filled with a sense of purpose and excitement. Our mission has always been to empower women with the knowledge and tools needed to protect and enhance cognitive vitality as we age.

Our initiatives, like Mind Over Matter® and our student program Brainable, delve into the science-backed lifestyle choices (the Six Pillars of Brain Health) that form the bedrock of brain health – a topic that resonates deeply with our shared commitment to living well at every stage of life.

The Six Pillars of Brain Health are more than just guidelines, they are a powerful testament to how our everyday choices can shape our cognitive futures. These pillars – Exercise, Mental Stimulation, Nutrition, Sleep, Social Activity, and Stress Management – are supported by a growing body of evidence that highlights their crucial role in maintaining cognitive function and reducing the risk of neurodegenerative diseases. By adopting these practices, we enhance our mental acuity and fortify our overall well-being.

But as we celebrate these universal pillars, it's vital to acknowledge the unique ways in which brain health intersects with sex and gender. Women experience distinct hormonal changes throughout life that can influence brain health, from pregnancy and menopause to the post-menopausal years. Despite these differences, much of the research in brain health has historically been conducted on men, with the assumption that findings would apply universally.

This gap in knowledge underscores the pressing need for more research that specifically explores how these factors impact women's brain health. Understanding these differences is not just about improving outcomes for women, it's about ensuring that every individual receives the most effective, personalized care possible.

As we advocate for more inclusive research, we also recognize the power of collaboration. Brain health challenges are too complex for any organization to tackle alone. That's why we are proud to stand alongside such like-minded partners as Brain Canada. Together, we are committed to advancing research that reflects the diversity of our population and to developing interventions that are informed by the unique needs of women and children.

Of particular note is our joint effort to fund new research into the impact of children's excess social media use and device addiction on their mental health, which you can read about in the article *Listen to the Children* on page 36.

By pooling our resources, knowledge, and passion, we can drive the breakthroughs needed to protect and enhance brain health for everyone.

In this issue, you'll find articles that explore topics like age-related inflammation, menopause and brain fog, the many faces of dementia, and spotlight the latest research on sex and gender differences in cognitive aging. We've also included interviews with leading experts who are at the forefront of this critical work, as well as practical tips for incorporating the Six Pillars of Brain Health into your daily life.

As always, we invite you to join us in this journey – whether by adopting new habits, engaging with the latest research, or simply sharing what you learn with those around you. Together, we can build a future where cognitive vitality is not just a possibility, but a reality for all.

Wishing you and yours ongoing good health.

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

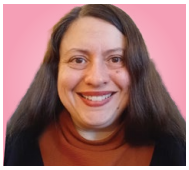
PHOTO: JAYLYN TODD

CONTENTS

LOOKING FOR MORE COPIES?

EMAIL US:
mom@womensbrainhealth.org

Contributors



ALEX MLYNEK // MANAGING EDITOR

Alex Mlynek is a Toronto-based journalist who has worked as an editor for *Today's Parent* and *Canadian Business* magazines. Her writing has appeared in a number of publications, including *Reader's Digest*, *Broadview*, *Chatelaine*, *Best Health*, *The Walrus* and *Report on Business*. She loves telling a good story and making copy entertaining and accurate. When she isn't hanging out with her husband and two kids, you will likely find Alex in her garden or with her nose in a book.

WENDY HAAF // WRITER

Wendy is a freelance health writer based in London, Ontario. As a longtime contributor to a Canadian retirement magazine, she has regularly covered topics related to healthy aging. A mother of three, including two adult daughters, and grandmother to a new granddaughter, she is particularly interested in providing women with evidence-based information about what they can do to protect and maintain their brain health throughout life.

STEPHANIE HAHN // WRITER

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

JANE LANGILLE // WRITER

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

SEAN MALLEN // WRITER

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

SUBHA RAMANATHAN // WRITER

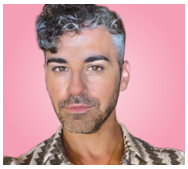
Subha is a director and research consultant for Atmoco Ltd., specializing in health promotion through physical activity. With a PhD in public health, Subha helps non-profits collect relevant information, make research findings understandable, and put recommendations into action. She also teaches a university 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.

KRISTINA RUTHERFORD // WRITER

Kristina Rutherford is a Toronto-based features writer for Sportsnet who has been working as a sports writer since 2007. She also has a pair of memoirs in the works, due to be published by Penguin and Simon & Schuster. Kristina enjoys telling stories about the people behind big wins and losses, and finding out how they got there. She had a very active childhood, and continues to play as many sports in her adult years as she did when she was a kid.

VITINA BLUMENTHAL // CREATIVE DIRECTOR

For over a decade, Vitina has lent her branding and design expertise to support WBHI's mission. Her passion for mindful living aligns seamlessly with the organization's mission to safeguard the mental and brain health of women, caregivers, and their families.



GREGORY CIRA // CREATIVE DESIGNER

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

COVER PHOTO: JAYLYN TODD

DOREEN MCCANNELL-BOTTERILL & JENNIFER BOTTERILL // ON THE COVER

Mother and daughter Doreen McCannell-Botterill and Jennifer Botterill have a number of things in common: both were the youngest members of their Olympic teams – in speed skating and hockey, respectively – and they share a passion for being active and doing what they love. "My parents were always about getting us involved, finding things we loved, and enjoyment was always the highest priority," Jennifer told Mind Over Matter®. "For us it was about having a healthy lifestyle, an active life. We had that routine from a young age about eating well, being active, and developing those habits." Doreen and Jennifer appreciate that Women's Brain Health Initiative promotes similar ideas. "It's impressive how passionate they are to share the best information and the most up-to-date research in the field to make sure that women are staying as sharp and as healthy as they possibly can," said Jennifer.

WE ARE TRULY GRATEFUL TO:

Fondation Brain Canada Foundation

Financial contribution from
Avec le financement de

Health Canada Santé Canada

AND ALL THOSE WHO GENEROUSLY SUPPORTED THIS PUBLICATION:

Beverley Andrews
AON
Lisa Applegath
Patrick Barry
Amara Chaudhary
CIBC
Crowe Soberman LLP
Jade Crystal
DAVIES
Krista Dietrich
Wilma Ditchfield
Margaret Hagerman
Susan Hodkinson
Helen Isaac
JoAnne Korten
Nancy Laughton
Sarah Pearl Litwin
Mark Lash
Ani Markova
Kulin Matchhar
Monica McIntosh
MNP
Leslie Myers
Margaret Nightingale
ONEX
Jan Petropoulos
Denise Pidgeon
Felicia Posluns
Joyce Posluns
Lynn Posluns
Wendy Posluns
Prime Quadrant Foundation
RBC Wealth Management
Elizabeth Ryan
Caitlin Saenz
Shiseido
Side Three
Maureen Simser
Lois Smith
Fran Sonshine
Sylvia Soyka
The Citrine Foundation of Canada
Timms & Bannister Foundation
Catherine Van Diepen
WeirFoulds LLP
Maria Zakos

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

The production of this magazine has been made possible in part with the financial support of Health Canada, through the Canada Brain Research Fund, an innovative partnership between the Government of Canada (through Health Canada) and Brain Canada. To date Health Canada has invested over $145 million through the CBRF which has been matched by Brain Canada Foundation and its donors and partners.

Do Tell

THE CASE FOR NARRATIVE-BASED MEDICINE

As a consultant in palliative medicine, Dr. Miriam Colleran places a high value on humanity, caring, and sensitive communication. It comes with the territory for someone who works with people facing the end of life. To navigate such delicate relationships, Dr. Colleran has come to lean on a concept called narrative-based medicine (NBM).

"Narrative-based medicine helps us to be more compassionate. It's really about re-humanizing medicine and helping us see the patient as a person," she told Mind Over Matter® from her home in the Irish town of Naas, southwest of Dublin.

IN PART, NBM INVOLVES DEEP, ATTENTIVE LISTENING TO WHAT A PATIENT HAS TO SAY ABOUT THEIR SITUATION

Earlier in her career, when she practiced in hospital and in family medicine, Dr. Colleran found that she interrupted patients more, pushing to get the point of an office visit, a habit that is unfortunately common in health care.

"NBM helped me focus more on the person, to be a better listener, letting them speak more, while obviously keeping in mind the other necessary questions. If we give the patient room to speak, they feel welcome to explain what's concerning them and what their wishes are for their care so we can help them.

> *"It makes us better people and better doctors.*

Dr. Colleran started with NBM during the pandemic when she came upon a virtual weekend workshop run out of Columbia University. Hooked, she followed up with a four-month foundational course at the University of Toronto's Narrative-Based Medicine Lab (narrativebasedmedicine.ca), where she interacted with other professionals in what she describes as a nurturing, supportive environment.

Dr. Colleran recently completed the Advanced Certificate in narrative-based medicine at the NBM Lab. She said it emphasized how close reading of literature can help to simulate the experience of the characters and connect emotionally with them, which aids empathy and tolerance toward others. She also learned about the importance of writing about her own experiences.

"NBM is a very broad area. There's no single accepted definition," said Dr. Karen Gold, the Curriculum Lead for the Lab.

"It's really understanding the role of story or storytelling and the application of narrative ideas and methods in the experience of illness and in health care."

IS NARRATIVE-BASED MEDICINE JUST FOR DOCTORS?

Dr. Gold, who was a clinical social worker for 29 years, said the courses are not only for physicians. Participants include other healthcare practitioners such as nurses and physical therapists, but also social workers, researchers, artists, and patient advocates.

"Writing allows them the space to step back and reflect. There aren't many opportunities to do that in today's healthcare system. It's a space where we come together to share experiences and listen to the experiences of others," she told Mind Over Matter®.

The Lab's co-founder, Dr. Allan Peterkin, said NBM helps practitioners cope with the stresses of their jobs and risk of burnout. Among the professionals he mentored was Dr. Colleran.

> *"There's a wellness aspect to it for doctors. The idea that every story is new is a remedy for feeling the monotony of the work or the depersonalization of the work.*

What we're hearing from the people we train is that there's a sense of renewal," continued Dr. Peterkin.

"As I say to my students, if you're a family doctor, you're going to treat 1,000 cases of congestive heart failure. But each patient has only one heart. So, the experience of finding out what's unique to each person's experience of illness is very interesting. And it makes the patient feel seen and heard."

HOW LISTENING HELPS

One of NBM's pioneers is Dr. Rita Charon of Columbia University, author of several books and dozens of papers on the subject. She teaches it via three "movements."

The first is paying "deep, profound attention" to what the patient is telling you. The second she describes as "representation," which is advising the practitioner to capture what they are seeing and perceiving in words or images. And the third is "affiliation," which she illustrated through her own technique in dealing with new patients.

"I follow my own drill. I don't write or type. I just put my hands in my lap, and I say, 'Please tell me what you think I should know about your situation?' And I don't interrupt," she said in an interview with Mind Over Matter® from her New York City office.

"My colleagues say: 'Rita, who can do that? You must have all the time in the world,'" she noted. "I say, if you're good at it, it doesn't take very long, and I learn things I never would have learned. It boils down to: What do you need? Not long ago I had a patient who said to me, 'You know what I really need? I need a new set of teeth!' She was a diabetic and I had no idea that teeth were the prominent thing on her mind. So that's where we started."

Dr. Charon said that while there have not been large-scale clinical studies on the effectiveness of NBM, there is compelling evidence of real benefits. She cited the example of oncology teams who participated in sessions in NBM at Columbia, sessions where tears flowed freely as practitioners spoke frankly about dealing with dying cancer patients. They reported afterwards that the cohesion of their team improved.

"They do their job better and they develop skills of listening to one another and knowing how to take in the perspective of another, which is an essential and difficult task. These smaller trials are showing significant changes."

Dr. Charon has also noticed differences between the sexes. More than three-quarters of the people who enrol in either the master's program or in the intensive sessions at Columbia are women, although she has seen the numbers of men slowly grow.

Dr. Chase McMurren, a Toronto-based physician, has heard Dr. Charon speak and admires her approach. He said he weaves NBM techniques into his psychotherapy practice with artists.

"We have to be slow, reverential, and respectful of people. It's important to slow down and respect that people are doing the best they can," Dr. McMurren said in an interview with Mind Over Matter®. He noted the concept of NBM resonates with his Indigenous ancestry.

> ***"It's an interesting fusion of Indigenous and non-Indigenous traditions. The stories themselves are medicine."***

While Dr. Colleran has found NBM to be helpful in her palliative care practice, there have also been personal benefits.

She writes poetry, sometimes drawn from work experiences, but also about her own life. Her work includes a poem about the death of her father, who passed away some time after her mother, both of whom had a rare form of cancer. Titled "Differently," it reads in part:

I THINK OF YOU WHEN I COOK DINNER

AND REMEMBER THE MEALS WE SHARED–

WHEN I NEED YOUR WISDOM,
YOUR SUPPORT, YOUR LOVE,

I REMEMBER YOU AND HEAR YOU SAY,

"THERE'S NO SUCH THING AS A WORRY

THAT'S STUPID TO THE PERSON WHO HAS IT."

I FEEL YOUR ABSENCE,

I MISS YOU BOTH, YOURSELF AND MAM,

JUST DIFFERENTLY.

Said Dr. Colleran: "Reflective writing has been a huge way of coping with grief for myself, but also with supporting the grief of others. I have to say that that's one of the big things narrative-based medicine did for me."

Step by Step

THE BENEFITS OF LABYRINTH WALKING

Labyrinth walking is an ancient practice that combines gentle movement with mindfulness and contemplation. It is a form of active meditation that can support physical, mental, and spiritual well-being.

In this article, we'll provide some background information and tips about labyrinth walking and review highlights from the research into its benefits for health and well-being.

WHAT IS A LABYRINTH?

A labyrinth is a geometric pattern on the ground with a single path that is followed from a single entrance into the centre and then back out again. This design is "unicursal" and is different than how mazes are designed.

Mazes are "multicursal," meaning they have multiple potential paths including some dead ends and perhaps more than one entrance, too. Whereas mazes are intentionally challenging to get through, labyrinths are intentionally simple.

Leslie Wright, an advanced labyrinth facilitator trained by Veriditas, a global not-for-profit organization focused on promoting personal and global transformation through the labyrinth experience shares:

"A common phrase used when teaching about the difference between a labyrinth and a maze is that 'a maze is designed to make you *lose* your way, while a labyrinth is designed to help you *find* your way.'"

Ms. Wright and her husband, John, who is also an advanced labyrinth facilitator, have a beautiful labyrinth in their backyard in Stratford, Ontario, where they host labyrinth walks for individuals and groups.

TYPES OF LABYRINTH

WALKING LABYRINTHS

Around the world, you'll find all kinds of different labyrinths – almost 6,500 of them in more than 90 countries, according to the latest information on the World-Wide Labyrinth Locator (labyrinthlocator.org).

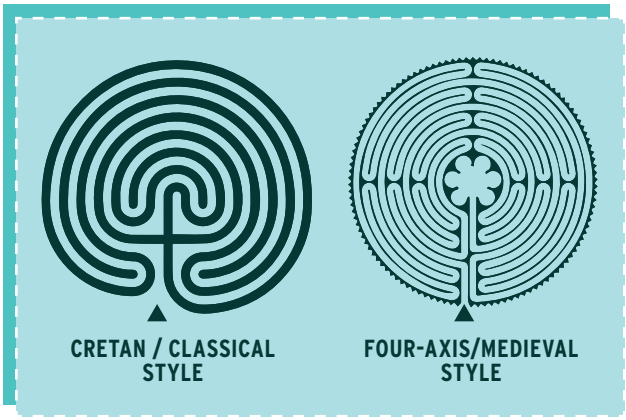
Some are outdoors, and some are indoors. Some are permanent, while others are temporary. They are made from a wide range of materials, including paving stones, mosaic flooring, canvas and paint, stones, bricks, sand or dirt, plants, masking tape, and even light projected onto the floor.

They are most often circular in shape, but may also be a square, rectangle, or any other shape. "There's even a labyrinth shaped like Snoopy's head at the Charles M. Schulz Museum in Santa Rosa, California," said Mr. Wright.

Labyrinths can be different sizes and have different numbers of "circuits" in their design, i.e., the number of paths around the centre.

A labyrinth with seven circuits, for example, would require you to walk around the centre seven times before reaching it, and then seven times again on the way out.

"One of the most famous labyrinths in the world is a 42-foot, 11-circuit design in the floor of the Chartres Cathedral in France. We're fortunate to have had the chance to travel to France and walk that labyrinth, and the experience was



CRETAN / CLASSICAL STYLE

FOUR-AXIS/MEDIEVAL STYLE

unforgettable," said Mr. Wright. "The one in our backyard is based on the same design, however, ours is a bit smaller – 30 feet across, with seven circuits."

The pattern of the Chartres path is referred to as the "medieval" or four-axis style. It has you move through four quadrants in a non-linear, unpredictable pattern with more turns and variability in path length compared to labyrinths with a "classical" or "Cretan" style, which have a predictable back-and-forth pattern. Unusual-shaped labyrinths, like the Snoopy one previously mentioned, are considered "contemporary" in style.

Labyrinths can be found in public and private spaces, including at places of worship, healthcare facilities (e.g., hospitals, hospices), universities and colleges, retreat centres, farms, and museums, as well as in parks, gardens, backyards, and even correctional facilities.

FINGER LABYRINTHS

Another type of labyrinth, a finger labyrinth, is believed to offer some of the same mindfulness-related benefits as full-size walking labyrinths.

Finger labyrinths are great for people with limited mobility, for times when you're not feeling well, or for situations when you simply don't have access to a full-size walking labyrinth.

They are also useful for students who struggle to focus, as an alternative to fidget devices.

What is a finger labyrinth? A finger labyrinth is a small labyrinth that fits on a desk or tabletop. It can be made of wood, paper, plastic, or anything that allows a visual representation of a labyrinth or an actual tactile experience, e.g., with grooves carved for the path in the wood or plastic.

"There are beautiful ready-made finger labyrinths that you can buy," said Ms. Wright. "However, you don't need an expensive one to experience the benefits. I've made simple finger labyrinths that worked really well using chunky yarn glued to a file folder or glitter glue on a regular piece of paper."

How do you use one? Using a finger labyrinth is very similar in many ways to walking a labyrinth except the movement happens through your fingers. You simply trace the path of the labyrinth mindfully, in and back out, lightly with your finger, usually multiple times.

Unique types of finger labyrinth. Many finger labyrinths have a single labyrinth path that you use with one finger on one hand. However, there are also finger labyrinth designs that include two mirror-image labyrinths side-by-side that can either be:

1. used by one person using both hands simultaneously – which can help synchronize the two hemispheres of the brain; or

2. used by two different people at the same time, sometimes in a therapy session or just in regular conversation to feel more connected to each other.

THE BENEFITS OF LABYRINTH WALKING

A review – published in 2021 in *International Journal of Yogic, Human Movement and Sports Sciences* – examined the findings from 18 academic articles on the physiological and psychological effects of labyrinth walking.

In that review, the author, Dr. Dustin Davis, notes that labyrinth walking is a meditative and spiritual experience that is found by some of the articles' authors to activate the right brain, facilitate contemplation and reflection, and foster creativity and intuition while eliciting a relaxation response that slows breathing, lowers blood pressure, and eases chronic pain and insomnia.

ANECDOTAL EVIDENCE INDICATES THAT PEOPLE EXPERIENCE MANY POSITIVE EFFECTS FROM LABYRINTH WALKING, INCLUDING EMOTIONAL AND SPIRITUAL CALM, BETTER DECISION-MAKING, HELP COPING WITH GRIEF OR HARDSHIPS, AND JOY.

However, Dr. Davis points out that the research to date lacks methodological rigour and focuses mainly on the psychological effects of labyrinth walking. In the end, he concludes that, based on the available evidence, labyrinth walking has mostly positive psychological effects but unclear physiological effects, and emphasizes the need for more research.

An interesting 2023 study by Dr. Jocelyn Shealy McGee and colleagues, explored the effects of *collective* labyrinth walking

with a shared intention, i.e., a group walk where individuals walk at the same time but in multiple locations while engaging in the same contemplative practice.

This study took place on World Labyrinth Day 2021, during the height of the COVID-19 pandemic, and included 461 participants from 19 countries (although the majority were from the United States). Participants were asked to reflect on this shared intention during their walk, which could be on any kind of labyrinth, including a finger labyrinth: "*In this year of suffering and uncertainty around the world, my intention is to walk a labyrinth with others on World Labyrinth Day to receive insights that can influence change*."

After participating in the collective labyrinth walk, the participants completed an anonymous online survey about their experience. Three main themes emerged from that survey – the collective walk provided (1) a sense of connectedness, (2) transcendent experiences (e.g., feelings of boundlessness and positive emotions), and (3) insights into how to cultivate compassionate action for their community. (This research was published in *Frontiers in Psychology*.)

WANT TO WALK A LABYRINTH?

First, find a labyrinth near you using the World-Wide Labyrinth Locator (labyrinthlocator.org).

Next, decide when you'll go. You don't need a special occasion; go anytime. (However, many people do choose to walk on special occasions like solstices and equinoxes, birthdays, and anniversaries, or to celebrate personal milestone like graduation or getting married.)

"For your first walk, it is ideal if you have a facilitator to guide your experience," said Mr. Wright. "However, if you're unable to find a walk being offered by a facilitator, you can prepare in advance yourself by reviewing information online about labyrinth walking or reading any posted information on signs at the labyrinth site to help you guide yourself."

"There are four stages you may go through in a labyrinth walk, although each of them is optional."

Right before you begin walking, there is the *Remember* stage, where you pause to feel gratitude, send blessings to others, or ask a healing question. Ms. Wright continued, "As you are walking into the centre of the labyrinth, it's the *Release* stage, a time to quiet the mind, let go of your troubles, open your heart, and be aware of your breathing."

"Once you reach the centre of the labyrinth, that's the *Receive* phase. Pause in the centre to reflect for as long as you like, as long as others aren't waiting, and open yourself up to insights from your small inner voice," Ms. Wright continued.

"Finally, as you are following the path back out of the labyrinth, you are in the *Return* phase. This is when integration of your experience happens. Notice how you feel – perhaps a sense of well-being, excitement, calm, or peace. Reflect on any insights you received."

Immediately after a labyrinth walk, you may want to journal for a bit.

Other guidelines and etiquette to keep in mind:

- **turn off your phone** or other electronic devices so that you will not be disturbed (or disturb others) while you're walking;
- **move at your own pace**, and if you are not alone in the labyrinth, know that it's fine to pass people or allow others to pass you on the path;
- **keep a soft gaze while walking**;
- **release any expectations**, and embrace whatever happens – it will be different every time; and
- **don't take any photographs** during the walk.

How often should you walk a labyrinth? As often as you feel called to! You might only walk one time, or occasionally, or every day if you're fortunate to have a labyrinth nearby. Research points to benefits from a single session of labyrinth walking and suggests there is likely even more benefit to repeated walking.

WORLD LABYRINTH DAY

An especially popular time to walk a labyrinth is on World Labyrinth Day. "Every year on the first Saturday in May thousands of people around the globe participate in World Labyrinth Day as a moving meditation for world peace and celebration of the labyrinth experience. People are encouraged to walk at 1 p.m. local time to create a rolling wave of peaceful energy passing from one time zone to the next," said Ms. Wright. "It's quite a powerful and moving experience that I highly recommend." You can find more information about World Labyrinth Day at worldlabyrinthday.org.

Age-Related Inflammation

LIFESTYLE CHOICES CAN HELP

When you hear the word "inflammation" you may initially think it sounds like a bad thing, but acute inflammation is actually a healthy, positive defence mechanism. It is the body's response to infection, damage, or injury, and it activates the immune system to trigger the healing process. The key word there is "acute," which refers to a severe and sudden response, but one that is short term and temporary.

In contrast, *chronic* inflammation occurs when there is ongoing, excessive activation of immune cells. This type of long-term exposure to inflammation is linked with myriad negative impacts on health.

Chronic inflammation can occur at any age, but "inflammaging" is a specific type of chronic inflammation that affects older adults.

It is chronic, low-grade inflammation throughout the body that occurs as one ages, in the absence of infection, damage, or injury. This pro-inflammatory state is characterized by elevated levels of inflammatory markers in the blood.

Research has found that inflammaging is linked with an increased risk of a variety of common age-related diseases, including cardiovascular disease, cancer, chronic kidney disease, neurodegenerative diseases, osteoarthritis, and depression, as well as adverse health outcomes such as disability, frailty, and premature death.

In this article, we focus on how inflammaging impacts neurodegeneration, and the steps you can take to delay or decrease inflammaging as you age to help you keep your brain healthy longer.

INFLAMMAGING & NEURODEGENERATION

Inflammaging has been shown to play a key role in the development of cognitive impairment and neurodegenerative diseases in aging individuals. There are many theories about why this happens. One potential explanation is that chronic inflammation appears to hinder the body's processes for cleaning up cell debris, at a time when more cells are being damaged and dying off due to aging.

Another is that inflammatory compounds cross the blood-brain barrier, contributing to negative effects such as atrophy of the hippocampus and increased oxidative stress (an imbalance of free radicals and antioxidants, leading to cell damage).

THERE IS LIKELY A COMPLEX INTERACTION OF FACTORS GOING ON BECAUSE INFLAMMAGING IS ALSO LINKED DIRECTLY WITH THE DEVELOPMENT OF CHRONIC AGE-RELATED DISEASES LIKE ATHEROSCLEROSIS, METABOLIC SYNDROME, AND TYPE 2 DIABETES (WHICH ARE KNOWN RISK FACTORS FOR DEMENTIA).

A 2022 review by Mx. Alexandra V. Sentyabreva and colleagues – published in *Brain Sciences* – looked at the research evidence to date about the connections between inflammaging and Alzheimer's disease, in particular.

"Our review disclosed that there is growing evidence of the relationship between Alzheimer's disease and chronic inflammatory diseases, as well as between Alzheimer's disease and age-related inflammation, i.e., inflammaging," said Mx. Sentyabreva, a PhD student and researcher at the Avtsyn Research Institute of Human Morphology, Petrovsky National Research Centre of Surgery in Russia.

"Some researchers consider inflammation the initial mechanism of neurodegeneration in Alzheimer's disease, believing that it is both a triggering and aggravating factor in the formation and accumulation of amyloid-beta plaques and tau tangles associated with the disease," explained Mx. Sentyabreva.

"It's not yet clear whether inflammation is indeed the *initial* mechanism, but there is ample evidence that inflammation clearly plays some role in Alzheimer's disease."

"However, it's important to note that all people develop inflammaging as they age, yet not everyone develops neurodegenerative diseases," continued Mx. Sentyabreva. "That indicates that the inflammatory process is not enough on its own to lead to neurodegeneration. More research is needed to determine how the multiplicity of variables interact."

TIPS TO HELP REDUCE INFLAMMAGING

Inflammaging varies across individuals, and its presence does not automatically lead to disease. Studies of centenarians – including one by Dr. Paola Lucia Minciullo and colleagues, published in *Archivum Immunologiae et Therapiae Experimentalis* in 2015 – have found that these long-lived people have markers of low-grade inflammation, just as most older adults do, but that inflammation is counterbalanced by the presence of anti-inflammatory molecules.

This suggests that greater longevity and healthy aging does not require the absence of inflammation, but rather a mix of pro-inflammatory and anti-inflammatory processes that balance each other out.

So, while inflammaging may be impossible to avoid completely, there are steps you can take to offset its effects as you age. Below are some evidence-based lifestyle tips to help reduce inflammaging and its many negative impacts on health.

MOVE MORE

Living a sedentary lifestyle is associated with higher levels of inflammation markers in older adults, so moving more is key to helping keep inflammaging in check. And research suggests that the benefit of exercising for reducing inflammation is not contingent on losing weight.

"While it is widely agreed that physical activity is an effective anti-inflammatory intervention, there is currently no consensus about the recommended exercise intensity and duration for optimal effect," said Dr. Niharika Duggal, an assistant professor at the University of Birmingham in the U.K. and one of the authors of the 2023 review "Inflammaging as a Target for Healthy Ageing" in *Age and Ageing*.

"As far as what type of physical activity is best, research has found that both cardiovascular (aerobic) exercise and resistance training have an anti-inflammatory effect if done regularly at moderate intensity. However, it's likely that all types of movement can help since prolonged periods of inactivity have been recognized as having pro-inflammatory effects, possibly due to weight gain and accumulation of visceral fat," continued Dr. Duggal. "Most importantly, it's never too late to start incorporating exercise and breaking up long periods of sitting."

EAT A HEALTHY DIET

What you eat, and don't eat, can have a direct impact on inflammation. Following the Mediterranean diet – which emphasizes high consumption of fruits and vegetables (including leafy greens), legumes, nuts, olive oil, and fish, and low consumption of red meat, dairy, and saturated fat – has a number of health benefits, including reduced inflammation.

"Eat a variety of fruits and vegetables of different colours to modulate the gut microbiota by promoting the growth of beneficial bacteria that produce anti-inflammatory short-chain fatty acids. However, try to eat certain fruits often since they are known to contain phytochemicals with protective anti-inflammatory and antioxidant properties, namely, blueberries, pomegranate, tomato, and watermelon."

"Green tea and curcumin have also been found to have anti-inflammatory properties, so consider adding those to your diet as well," continued Dr. Duggal.

What should you avoid, or minimize, eating? Ultra-processed foods. They are calorie-dense and low in fibre and nutrients, contain artificial ingredients, and tend to be high in salt, sugar, and trans fats. A diet high in these types of food (i.e., packaged snacks, frozen meals, and sugary drinks) is associated with an increased risk of inflammation (as well as with the many diseases and disorders that are linked to inflammation such as obesity).

MANAGE STRESS

"Managing stress helps combat inflammaging by reducing cortisol, a hormone that encourages the storage of visceral fat," explained Dr. Duggal. (Visceral fat, which is a known factor in chronic pro-inflammatory responses, is not always visible from outside the body since it is found around the internal organs.)

"There are many ways to relieve stress, including exercise, time spent in nature, meditation, socializing with others, and getting enough sleep," continued Dr. Duggal, "so choose whatever activities you enjoy most."

GET ENOUGH GOOD-QUALITY SLEEP

Chronic insufficient sleep is linked with inflammation and negative health effects including metabolic syndrome and cardiovascular disease (which are themselves associated with increased levels of pro-inflammatory markers in the body). On the other hand, *good* sleep provides long-lasting immunoenhancing effects.

Sleep is so important in part because of its relationship with stress. "Sleep disturbances can lead to dysregulation of the HPA axis, resulting in altered cortisol secretion," explained Dr. Duggal. (The HPA axis is the communication system between the hypothalamus, the pituitary gland, and the adrenal glands. It plays a major role in stress management.)

Although not everyone experiences problems with sleep as they age, many people do, frequently indicating difficulties

SEX DIFFERENCES IN INFLAMMAGING

The immune systems of women and men differ, however the sex-specific distinctions change over their lifespan.

There are pre-existing differences in immunity between women and men when they are young, but then those differences shift as menopause and andropause unfold.

A 2023 paper by Dr. Fabiola Olivieri and colleagues reviewed sex-dependent differences related to inflammaging and found they are affected by hormones. In particular, they reported that women have an immune system advantage over men during their reproductive years, but reduced estrogen production post-menopause is associated with immune system changes that eliminate that advantage.

As a result, women tend to live longer but experience worse health in later life compared to men. (These findings were shared in *Mechanisms of Ageing and Development*.)

falling or staying asleep for example. This type of poor sleep with age can exacerbate inflammaging.

Exercising regularly is one of the best ways to improve sleep at any age, along with good sleep hygiene habits, i.e., things like going to bed at the same time each night, keeping your bedroom dark and cool, and turning off all screened devices at least an hour before bed.

CONNECT WITH OTHERS

There is an abundance of research showing links between systemic inflammation and negative emotional states (including loneliness).

Emerging evidence suggests that loneliness may be a driving factor in the link between stress and inflammation.

Collectively, these findings emphasize how important it is to address loneliness, not just because it feels better emotionally to be connected with others in meaningful ways but also because doing so supports our physical health.

TAKE SUPPLEMENTS

"You might also want to consider taking supplements that have shown potential to reduce inflammation," said Dr. Duggal. "Those include Omega-3 polyunsaturated fatty acids, resveratrol, vitamins C and D, magnesium, and probiotics."

(Note that curcumin, mentioned in the healthy diet tip because it can be used as a spice in cooking, is also available as a supplement.) Be sure to consult with your health provider for guidance about which supplements to take and in what dosage, as what is recommended will vary by individual.

It's interesting, but not surprising, that this list of tips mirrors most of the Six Pillars of Brain Health: Exercise, Nutrition, Social Activity, Stress Management, and Sleep. (The only pillar that is missing is Mental Stimulation.) For detailed information about the six pillars, check out the article "Do You Know Your Six Pillars of Brain Health? Reduce Your Dementia Risk Through Your Lifestyle Choices" in Mind Over Matter® magazine volume 15, which you can read at womensbrainhealth.org/mind-over-matter-magazine.

Inflammation is clearly one of the underlying mechanisms that affects brain health. Taking steps to reduce inflammation will support not just your brain health, but the health of all the systems in your body.

"As scientists continue their research into inflammaging, it's possible that they may discover a medication that will help stop, reverse, or delay this age-related inflammation," said Dr. Duggal. "In the meantime, though, isn't it great to know there is so much you can do in terms of lifestyle factors to help stave off inflammaging and keep your brain as healthy as possible as you get older?"

Brain-Boosting Botanicals

UNLOCKING THE POWER OF HERBS

If you do a quick online search for herbs for brain health, you'll probably see articles that list the "top" or "best" herbs that benefit the brain in some way.

There's something very compelling about the possibility that we could consume a particular herb – preferably in an easy-to-take supplement form – and boost our brain health.

We naturally prefer an easy solution if one is available. So, it's not surprising that researchers have been studying the effects of individual plants (often individual components of a given plant), and that articles have been written to share key highlights from that research.

In this article, we'll share the findings from a recent review on "nootropics," highlighting a few of the top herbs for brain health mentioned in that review. Then we'll dive deeper into the power of plants to support brain health in a holistic way.

SOME TOP HERBS FOR BRAIN HEALTH

An academic review by Dr. Matej Malik and Dr. Pavel Tlustoš – published in 2023 in *Plants* – focused on nootropic herbs, shrubs, and trees, i.e., plants that have been studied for their potential to improve cognitive function. Below is a summary of four of the herbs they looked at, ones that are commonly promoted as brain-boosting herbs.

- **Ginkgo biloba** is rich in antioxidants and is anti-inflammatory. It has a long history of use as a treatment for dementia in traditional Chinese medicine and some research has found that it may indeed enhance cognitive function or slow cognitive decline in people with Alzheimer's disease (AD) or

WHAT'S THE DIFFERENCE BETWEEN HERBS & SPICES?

The terms "herb" and "spice" are commonly used interchangeably, but there is actually a difference between the two. They both come from plants, but different parts. Herbs are the leaves of a plant, used fresh or dried, while spices are made from seeds, bark, flowers, and/or roots of plants that are dried and then ground or crushed.

mild cognitive impairment (MCI). However, research findings to date have been inconsistent, so more research is needed.

- **Ashwagandha**, which contains many valuable phytochemicals, has been used successfully in Ayurvedic medicine for more than 3,000 years to treat neurological disorders (among other things). Research suggests that ashwagandha may mitigate oxidative damage (which is associated with the development and progression of AD) and inhibit the formation of amyloid-beta plaques (a hallmark of AD). The review noted that although the research findings are promising, there is "still a lack of accurate clinical data to support its therapeutic use" as a nootropic.

- **Ginseng** is one of the most popular herbal medicine plants. Studies suggest it can have beneficial effects on cognitive performance, with few reported side effects. However, the results vary across studies, in part because of variations in study design. In the end, the review concluded that there is insufficient high-quality evidence to reach any firm conclusions about the cognitive-enhancing effects of ginseng in healthy individuals or in people with dementia.

- **Gotu kola** is a medicinal herb that has been used in Ayurveda and traditional Chinese medicine for thousands of years. The review noted that gotu kola has remarkable neuroprotective and cognitive-enhancing properties. Yet, the researchers again concluded that there was insufficient clinical evidence to confirm that gotu kola improves cognitive function.

In total, the review examined the research on ten nootropic plants – the four above plus **maca**, **rhodiola**, **schisandra**, **eleuthero**, **guarana**, and **water hyssop (bacopa).**

A theme emerged in their review of these plants.

They all show "substantial potential therapeutic benefits" for cognitive function and have often been used with success for years in traditional medicine. But the key word is "potential."

The researchers were careful to point out that there is still "considerable debate as to the effectiveness of these plant formulations" because findings to date have been inconsistent or unreliable. More research is needed to flesh out the many unanswered questions, such as which plants (or which components of a given plant) provide which therapeutic benefit to which population, in what format, and at what dosage and frequency.

A HOLISTIC APPROACH

Seeking scientific proof of the efficacy of a single plant or specific compound from a plant is popular in part because researchers are hoping to discover compounds suitable for new drug candidates (or supplements).

"There are certainly times when supplements or drugs are needed, but integrating plant medicine into your day-to-day life is something that everyone can and should do to help keep the brain, and entire body, healthy," said Christine Dennis, a medical herbalist based in Ontario. "Making food your medicine is key."

RATHER THAN LOOKING FOR INDIVIDUAL HERBS THAT ARE PARTICULARLY SUPPORTIVE OF BRAIN HEALTH, IT'S IMPORTANT TO THINK MORE BROADLY AND HOLISTICALLY. OUR BODIES ARE MADE UP OF COMPLEX INTERCONNECTED SYSTEMS THAT MUST ALL WORK TOGETHER.

For example, Ms. Dennis pointed out that a healthy cardiovascular system is critical for brain health. "You need to have a healthy cardiovascular system as a foundation for brain health," she explained. "If you don't, then any nutrients you take in can't get to where they are needed."

So, herbs known for supporting heart health – such as **hawthorn**, **hibiscus**, and **motherwort** – are just as important as the herbs described in the previous section that are typically associated with better brain health.

Using whole plants rather than isolated components of a plant is important, too. "Each plant contains hundreds or thousands of chemical constituents that work synergistically," said Ms. Dennis. (This may be one of the reasons why scientific studies of isolated plant compounds have had limited success or resulted in inconsistent findings.)

Ms. Dennis also emphasized that while modern science may not yet have proven the effectiveness of various plants for brain health, we can trust the centuries of experience from traditional medicine to guide us for now. "This *is* a type of valid evidence; it's just a different way of knowing," she said.

"Much research involves experiments looking at the use of isolated plant compounds in animals, but it's important to acknowledge that there is a very long history of usage of whole plants by humans that has provided an abundance of knowledge about the power of plants for health," said Ms. Dennis.

"Herbs and spices have been used safely for hundreds or thousands of years not just as flavourings. People knew of the health benefits and understood their importance, making spices very valuable currency in ancient economies."

"Nootropic" is a term used to describe a natural or synthetic substance that "enhances cognition and memory and facilitates learning." The term was coined from the combination of two Greek words, nöos, which means "thinking," and tropein, which means "to guide."
Source: Merriam-Webster Dictionary

TIPS FOR SUPPORTING BRAIN HEALTH WITH HERBS

So, what exactly is a person to do if they'd like to support their brain health with herbal medicine?

If you're experiencing a serious health condition or are taking medication consult with a professional herbalist or your healthcare practitioner for guidance about using supplements.

There is a lot you can do on your own as well, whether you are seeking to maintain or improve your brain health.

Rather than a prescription of specific herbs to take, this is a list of tips to make herbal medicine a part of your everyday life.

- **Use herbs and spices liberally in your cooking**
  Cooking with herbs and spices adds a wealth of flavonoids – plant compounds that can inhibit neuroinflammation and enhance cognitive performance – to your meal.

  "The real magic of herbal medicine lies in herbs and spices. They contain far more chemical constituents than fruits and vegetables do, and they are easy and delicious to add to your meals," said Ms. Dennis.

  "So, the more herbs and spices you use, the better. Any time you are preparing a food or drink, consider if there are any that you can add, to give it both a flavour and nutrition boost."

  Any kind of herb or spice will do, but here are just a few examples with affinity to brain and/or heart health: sage, rosemary, sweet marjoram, oregano, thyme, mint, turmeric, ginger, and cinnamon.

- **Drink herbal teas** Consuming tea (either hot or cold) made from various herbs is a great way to increase your intake of brain-healthy phytochemicals. Look for all-natural teas without any added flavouring or make your own loose-leaf tea from individual herbs or blends you create.

  And avoid adding any sweetener if you want to maximize the brain benefits. Any type of herbal tea will be a good choice, but here are some suggested brain- and heart-healthy herbs you might want to try: lemon balm, tulsi (holy basil), green tea, any type of mint, hawthorn, rosehips, lavender, and catnip.

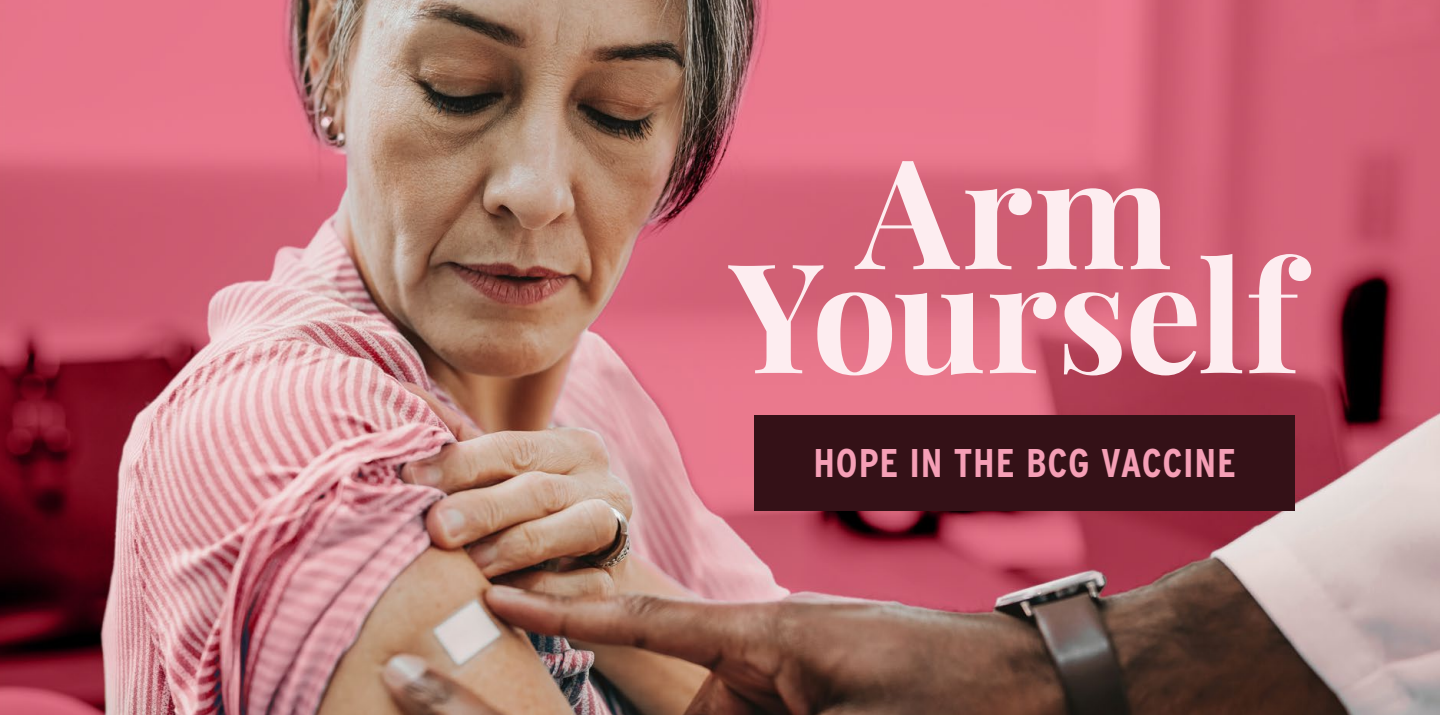
- **Diversify the herbs and spices you use** "Variety is key whether your goal is prevention or treatment. You want to take in as many different phytonutrients as you can to support vibrant health," said Ms. Dennis.

  "Pay attention to what you're buying each time you visit the grocery store or farmer's market. It's likely that you keep putting the same things in your cart week after week. I recommend trying new recipes or just experimenting with adding new herbs and spices to your usual cooking – whatever will inspire you to expand the diversity of the plant foods you're eating. I especially recommend incorporating as many *fresh* herbs as you can."

- **Diversify the sources of herbs and spices, too** "You want to increase the diversity of the nutrients you consume by eating lots of different types of herbs and spices, but it's great to diversify even more than that by increasing the *microbial* diversity of the herbs and spices you eat," said Ms. Dennis.

  "Every garden has its own microbiome with a unique mix of beneficial microbes, so you can diversify your gut microbiome by eating plants from different places." You might try growing your own in a backyard garden or indoor pot, swapping herbs with friends/neighbours/family, and buying directly from different farmers. (To learn about the importance of a healthy gut microbiome for brain health, check out the article "Gut Reaction: Bacteria and Your Brain Health" in volume 7 of Mind Over Matter® magazine.)

- **Be consistent and patient** Herbal medicine takes time to work. It's not a quick fix. "Incorporating a wide variety of herbs and spices into your diet regularly should be a long-term goal, something you make a permanent part of your day-to-day lifestyle," advised Ms. Dennis. "Not only will your body and mind start to feel better over time, but your food will also be more interesting and delicious!"



Arm Yourself

HOPE IN THE BCG VACCINE

A century-old vaccine for a once-prevalent disease now shows promise as a new application for a growing health threat in the 21st century. When the Bacillus Calmette-Guérin vaccine was developed in France in the 1920s, it was a breakthrough in the fight against tuberculosis (TB).

NEW RESEARCH SHOWS THIS VACCINE MAY BE ABLE TO HELP WARD OFF ALZHEIMER'S DISEASE (AD), CASES OF WHICH ARE EXPECTED TO SKYROCKET OVER THE COMING DECADES.

Bacillus Calmette-Guérin (BCG) was named after the Parisian scientists who developed it, Albert Calmette and Camille Guérin. TB, or consumption as it was called in those days, was the leading cause of death in Europe in the 1800s.

BCG proved to be a lifesaver. Its arrival, along with a variety of improvements in treatments and public health, meant TB became far less of a threat in developed countries, so much so that the vaccine is no longer widely administered in Canada or the U.S.

Recent research has given BCG new relevance, with findings that show it could be effective against an array of conditions, including diabetes, multiple sclerosis, and even AD.

"The benefits of this drug just keep coming out in randomized trials around the world for all these disease indications," Dr. Denise Faustman, an immunologist and associate professor at Harvard Medical School, said in an interview with Mind Over Matter®.

"So, all of us who work on this globally are just driven to try to get these benefits to the public," she added.

Dr. Faustman is part of an international BCG working group that meets about every 18 months to talk about ways to encourage more researchers to explore the vaccine's potential.

THE AD CONNECTION

The AD angle emerged through studies of people with bladder cancer, for which BCG has become a common treatment. In 2019, researchers at Hadassah-Hebrew University Medical Centre in Jerusalem published the results of a study in *PLoS One* of 1,371 bladder cancer patients, some of whom received BCG and some of whom did not. The researchers concluded:

"Bladder cancer patients treated with BCG were significantly less likely to develop AD at any age than patients who were not so treated. This finding of a retrospective study suggests that BCG treatment might also reduce the incidence of AD in the general population."

Those findings were backed up by an even larger American study published in 2023 in *Jama Network Open* that looked at 6,467 bladder cancer patients over a period of 34 years. It found a "significantly lower rate and risk of ADRD (Alzheimer's disease and related dementias)" among people treated with BCG.

Two 2024 papers explored the reasons why BCG is having this effect and suggested it deserves closer consideration as a possible vaccine against AD. They concluded that it all has to do with boosting the immune system.

"THE BASIC IDEA COMES FROM THE NOTION THAT MICROBIAL INFECTION MIGHT BE INVOLVED IN THE ETIOLOGY (CAUSE) OF ALZHEIMER'S DISEASE,

explained Professor Richard Lathe, a molecular biologist at Edinburgh University, who co-authored the papers with Professor Charles Greenblatt of Hebrew University.

He also told Mind Over Matter® that the concept is supported by several lines of evidence. He noted that microbes are detected in the AD brain at much higher levels than normal. The immune system tends to decline as we age, leading to a variety of conditions associated with microbial proliferation.

While the amyloid-β (Aβ) peptide is often found in the brains of people with AD, there is research indicating that Aβ is not causing the disease but is rather a defence mechanism against microbes.

THE BCG VACCINE PROTECTS AGAINST TUBERCULOSIS BY INTRODUCING INTO THE BODY A WEAK VERSION OF THE BACTERIA THAT CAUSES TB AND, IN THE PROCESS, STRENGTHENS THE IMMUNE SYSTEM.

Professor Lathe credits his co-author with making the link between the vaccine and AD: "The original discovery went back to Chuck Greenblatt, who argued that if Alzheimer's is caused by infections, and if BCG is effective by stimulating the immune system, then we ought to see a decline in rates of AD."

They surveyed five different studies and found that, on average, bladder cancer patients who were treated with BCG had approximately 45% fewer cases of Alzheimer's than those of a similar age who did not receive the vaccine. The conclusion was that "it could represent a sea-change in how we manage patients with mild cognitive impairment through to dementia."

Professor Lathe said that much larger clinical trials are needed to confirm the findings, but some scientists are already convinced.

"What's intriguing is that many professionals in the field openly admit to having been BCG-vaccinated. I've been BCG vaccinated. So, a lot of professionals actually believe this," he said.

"It's probably worth it (to get the vaccine), even if you've got Alzheimer's disease, because you can tip the balance."

A SPECTRUM OF IMPACT

There are multiple research projects that have been already done or are underway to determine BCG's effectiveness against a broad range of diseases and conditions.

A study published in *BMJ* of newborns in the tiny African nation of Guinea-Bissau found a 38% decrease in all forms of neonatal mortality among babies who were vaccinated with BCG. That project inspired scientists at the University of British Columbia (UBC) to investigate further, and their research indicated a dramatic and rapid impact.

Within three days of administration, the vaccine could reduce mortality from sepsis among newborns. The study found that BCG stimulated the production of neutrophils, which are a type of white blood cell that helps the immune system fight infections.

"The evidence seems to be telling us that BCG is extremely good at training the innate immune system," said Dr. Nelly Amenyogbe, who was part of the UBC research team. The vaccine is already administered to newborns in many developing nations, but often only reaches half of the babies, due to supply issues. She told Mind Over Matter® that the findings should encourage public health officials to improve their vaccination rates.

Now a post-doctoral fellow at Dalhousie University, Dr. Amenyogbe is exploring BCG further and believes the vaccine merits a much wider study.

"We need to understand what it is about BCG that makes it so special in this regard, but also use that knowledge to understand how a well-trained immune system might be the common denominator to prevent many different things that we're suffering with today."

The evidence is mounting on several fronts. Scientists at McGill University concluded that it had an impact against the most common strain of influenza. And Dr. Faustman at Harvard is working on a project involving children with Type 1 diabetes.

> ***"It's a fun topic, because this is what academics should be doing – repurposing drugs that are known to be safe, that have huge health benefits and maybe durable, lasting effects.***

Dr. Faustman said that the challenge now is to get the funding to support the kinds of large-scale trials that can confirm the findings and then prod regulators to allow widespread vaccination programs.

"Alzheimer's is obviously a disease that affects large populations," she noted. "It's disabling and costly. And our limitation right now is we need money to support trials with a safe, generic drug, and that's what will move these projects forward."

While there remains no cure for Alzheimer's disease (AD), medical science has made significant improvements in diagnosing it. Biomarker tests that analyze cerebrospinal fluid, measuring certain proteins associated with AD, have an accuracy rate of upwards of 90%.

That is a major upgrade on previous methods, which involve a series of clinical tests and observations. Depending on the skill and experience of the practitioner, the diagnosis could be correct anywhere from 60% to 80% of the time.

Would You Want to Know?

THE IMPACT OF ALZHEIMER'S TESTING ACCURACY

EXPLORING THE IMPACT

Improved accuracy is obviously a good thing. But Dr. Mari DeMarco of the University of British Columbia (UBC) says it raises new questions, both for the person with AD and their healthcare providers.

"Does increased diagnostic accuracy change subsequent medical care provided? And what about the effects on the person undergoing testing and their family members? What did testing mean to them? And how do they now navigate through this whole process?" said Dr. DeMarco.

She is a clinical chemist at St. Paul's Hospital, Providence Health Care, and a clinical professor in UBC's Department of Pathology and Laboratory Medicine. She also leads the national AD biomarker testing program, which is accessible to individuals across Canada.

Recognizing the changing diagnostic landscape for AD, Dr. DeMarco and her collaborators led an observational research study that sought to understand how biomarker testing altered medical care, how patients and their families felt about going through the whole process, and what testing meant for them.

Called IMPACT-AD, it was the first of its kind in the world and was funded in part by Women's Brain Health Initiative and Brain Canada.

Dr. DeMarco and her team conducted interviews with B.C.-based patients who had undergone the biomarker testing, as well as a family member or close friend. One of the first questions considered was the state of mind of the person about to undergo testing. An AD diagnosis is life altering, and it would be natural to think that someone would approach a definitive diagnosis with a sense of dread. But that's not what the researchers discovered.

> ***Surprisingly, we found that participants reported the decision to undergo testing as an 'easy' decision, motivated by their desire to better understand why they were experiencing cognitive changes.***

Her team's paper, published in April 2024 in *Alzheimer's & Dementia: The Journal of the Alzheimer's Association*, reports that 90% of patients rated their decision to undergo testing as "easy."

ACCESS TO TESTING

It is important to understand that biomarker tests are not done on just anyone who wants to find out if they may one day develop AD. Testing is only accessible to people who are already showing signs of cognitive decline and have discussed the test with a doctor who specializes in disorders like AD.

"People undergoing testing are individuals who are seeing a specialist because they've had challenges with their brain health and are actively seeking a confident diagnosis as to why they were experiencing these challenges," explained Dr. DeMarco.

"Patients and family members, through the IMPACT-AD research study, explained that testing was helpful in relieving the part of their anxiety around not having a confident diagnosis. They also expressed that having that confident diagnosis was helpful in planning for the future."

Quoting from the research study:

Post-disclosure, the majority (82%) reported overall positive feelings from having greater certainty and the ability to plan ahead, and results spurred them to adopt/continue healthy behaviors such as exercise (84%) and cognitive activities (54%).

Care partners expressed relief from having more diagnostic certainty, increased appreciation of future caregiving responsibilities, and a desire to connect with support resources.

ACCURACY IMPROVES CARE

An accurate diagnosis also means the patient does not need to keep undergoing tests and it allows healthcare practitioners to better plan the road ahead thanks to this assurance.

"Having it increases a physician's confidence in making the diagnosis, which could in turn impact how they manage the disease moving forward," said Dr. Saskia Sivananthan, Partner and Head of Strategy, Brainwell Institute and an affiliate professor at McGill University.

"While there is no cure for Alzheimer's disease, there is much, much more that can be done with what is communicated to the patient. Lifestyle changes are crucial even at the early stage of the disease, and more evidence is showing that changing your diet, exercise, increasing social connectivity, and mindfulness does slow the progression of the disease," added Dr. Sivananthan.

HOW SEX & GENDER PLAY A PART

Given that AD affects women at a much higher rate than men, researchers are increasingly taking sex differences into consideration as part of their studies, trying to understand the reasons behind the disparity.

Dr. Carmela Tartaglia of the University of Toronto says there is little conclusive evidence that the biomarker tests have a gap in accuracy between the sexes.

"I would say we don't think that they're ineffective in men versus women, or women versus men. I think the jury is still out on whether they work, equally well. The difference may be nominal," said Dr. Tartaglia, a professor, Tanz Centre for Research in Neurodegenerative Diseases at U of T and Co-director of the UHN Memory Clinic.

In their surveys, the IMPACT-AD team found that impacts from testing were largely similar between women and men.

One difference observed was that as a result of biomarker testing, female family members and friends expressed greater recognition of their likely future role as a care partner. They also tended to ask more questions about caregiving resources, a reflection perhaps of the reality that far more women than men are caring for a person with dementia.

BETTER SUPPORT

An important product of the IMPACT-AD study was a better realization of the needs of people who have received an AD diagnosis, along with their care partners.

"It's wonderful what we've been able to learn directly from the patients and their family members, as this in turn helps us improve the process and resources for future patients and family members undergoing testing," said Dr. DeMarco.

The researchers discovered that patients and family members valued the time their doctor took to fully inform them about the test so that they could approach the process with full knowledge of the implications.

It is also important for those who receive a diagnosis of a neurodegenerative disease to be provided with essential information to help guide them.

"Participants told us that after both pre- and post-test counselling visits with their doctor, they valued having information they could take home with them. To support these needs, we developed guides – in partnership with patients, family members, and healthcare professionals – to support common questions related to biomarker testing, the meaning of test results, and available community resources for persons diagnosed with Alzheimer's disease or a related disorder," she said.

These resources are all publicly available on the IMPACT-AD website: impactad.org/resources.

Dr. DeMarco said she is grateful to Women's Brain Health Initiative, Brain Canada, and other supporters, given that this kind of project can be challenging to fund. It does not have the novelty of a new discovery, rather it is all about how to put a discovery into clinical practice.

> **"IT HAS SUCH A HUGE IMPACT ON PATIENTS AND FAMILY MEMBERS. IT IS WONDERFUL THAT OUR FUNDING PARTNERS RECOGNIZED THE IMPORTANCE OF IMPLEMENTATION RESEARCH, LIKE THE IMPACT-AD STUDY, WHICH AIMS TO DIRECTLY AND IMMEDIATELY IMPROVE CARE FOR PEOPLE WITH ALZHEIMER'S DISEASE.**

IMPACT-AD has already moved on to the next step, expanding beyond the borders of British Columbia. In collaboration with the Canadian Consortium on Neurodegeneration in Aging, the team is now gathering and analyzing new data from participants across Canada.

The IMPACT-AD study was supported with a grant from Brain Canada through the Canada Brain Research Fund with the financial support of Health Canada, Michael Smith Health Research BC, the University of British Columbia's Faculty of Medicine and the Djavad Mowafaghian Centre for Brain Health, Women's Brain Health Initiative, and the St. Paul's Foundation.

More Harm Than Good?

WEIGHING IN ON THE BENEFITS & ADVERSE EFFECTS OF ANTIPSYCHOTICS

Antipsychotic medications (antipsychotics) are widely prescribed for a variety of illnesses and disorders to people of all ages. They were initially used primarily to help people with schizophrenia and related psychoses.

But their use has expanded dramatically, and they are now prescribed for a range of other conditions, including severe depression, bipolar disorder, anxiety, obsessive-compulsive disorder, post-traumatic stress disorder, attention-deficit hyperactivity disorder, Tourette syndrome, insomnia, autism, and dementia.

According to a fact sheet published by IQVIA, more than 1.5 million individuals in Canada used antipsychotic medications in 2022, an increase of 19% since 2019.

That equates to a prevalence rate of 4% in 2022 for the Canadian population overall. The prevalence is 23% higher among women than men.

Statistics for antipsychotic use in the United States indicate that the prevalence overall was 1.6%, based on pooled data from 2013-2018. Just as in Canada, usage of antipsychotics in the U.S. is higher among women than men – with 53.3% of usage by women vs. 46.7% by men.

The effectiveness of antipsychotics is well-established, especially for reducing and controlling such psychosis symptoms as hallucinations, delusions, and disordered thinking. However, antipsychotics also have wide-ranging adverse effects that vary depending on the type being used.

This article reviews some of the latest findings about these adverse effects.

A HISTORY OF HELP & HARM

First-generation antipsychotics – discovered in the 1950s – revolutionized psychiatric care for people with severe mental illness, allowing many of them to be discharged from hospitals and be treated in the community instead.

Since antipsychotics do not "cure" psychosis but instead only treat the symptoms, people usually took them indefinitely.

However, taking these first-generation antipsychotics for this length of time commonly resulted in many troubling side effects, including muscle stiffness, tremors, tics, and tardive dyskinesia (a movement disorder involving involuntary facial tics such as lip-smacking, sticking out the tongue, grimacing and/or frequent blinking).

So, people enthusiastically welcomed the second generation of antipsychotics, which were introduced in the 1990s and promised all the benefits of the first-generation medications without the negative movement-related side effects.

FAIRLY QUICKLY, THOUGH, IT BECAME CLEAR THAT THESE NEW MEDICATIONS, WHILE AVOIDING MOVEMENT PROBLEMS, WERE COMMONLY CAUSING ADVERSE METABOLIC EFFECTS SUCH AS SEVERE WEIGHT GAIN AND TYPE 2 DIABETES THAT, IN THE LONG TERM, WERE NEGATIVELY IMPACTING HEALTH AND SHORTENING LIFESPAN.

Over the years, research has linked antipsychotics to a wide range of additional adverse effects beyond the most common movement-related and metabolic effects, including cognitive impairment, brain shrinkage, seizures, coronary heart disease and stroke, acute respiratory failure, sleep apnea, embolism, dry mouth, drooling and cavities, osteoporosis, and impulse control disorders. Although the list of potential side effects is quite long, not all of these effects are common or supported by robust research evidence.

A recent academic review by Dr. Seena Fazel and colleagues – published in *Neuroscience and Biobehavioral Reviews* in 2023 – looked at the current state of research on the adverse effects of both generations of antipsychotics. After synthesizing the evidence from 32 meta-analyses involving almost 40 million participants, the researchers found that 47 adverse effects had been reported.

Of those, 32 adverse effects were rated moderate or high for consistency and robustness of the findings. Among those 32 adverse effects, the ones with the highest effect size were metabolic syndrome, urinary incontinence, sudden death, blurred vision, hypertonia, somnolence, and gait abnormalities.

Metabolic syndrome is a cluster of risk factors related to cardiovascular disease, including abdominal obesity, high blood pressure, impaired fasting glucose, high triglycerides, and low HDL cholesterol.

Hypertonia refers to having too much muscle tone, i.e., stiff muscles.

Somnolence is drowsiness, or a strong desire to go to sleep.

Gait is a person's manner of walking.

According to Dr. Fazel, a professor of forensic psychiatry at the University of Oxford in England, among all the adverse effects reported in the research they reviewed, three types had the most consistent evidence:

1. endocrine and metabolic effects;
2. movement-related outcomes; and
3. sedation and sleep-related outcomes.

"It's clear that both the first- and second-generation antipsychotic medications come with a host of possible adverse effects, some of which are common and a small proportion of which could be serious," he said.

SEX DIFFERENCES WITH ANTIPSYCHOTICS

There are sex differences in the prevalence of antipsychotic use, with women more likely to take these medications than men. That's not the only sex difference when it comes to antipsychotics, though.

A 2024 review by Dr. Mete Ercis and colleagues – published in *Journal of Affective Disorders* – found that there are also potential differences in the effectiveness and adverse effects of antipsychotics. They concluded that "women may respond better to antipsychotics than men, but also experience more side effects."

"The benefits these medications provide have to be weighed against these potential adverse effects when deciding who should take which of these medications, at what dose, and for how long."

Dr. Fazel felt more research using different research designs is needed to help update and refine best practices for prescribing antipsychotics. This is complex because there is a gradient of effectiveness for different antipsychotic medications, with each kind coming with a different balance of benefits and risks.

"Although our review focused on outlining potential negative side effects and found evidence of such in trials and observational studies, it's important to remember that there is a strong and robust evidence base for their efficacy for many outcomes in severe mental illness, including symptomatic improvement to reduce relapse and readmission rates," he noted.

"Also, the quality of much of the research on adverse effects that we reviewed was low, so more research on longer-term outcomes of using antipsychotics is necessary."

ANTIPSYCHOTICS FOR PEOPLE WITH DEMENTIA

Antipsychotic medications are frequently prescribed for people with dementia to help manage some of the more challenging behavioural and psychological symptoms of dementia, e.g., agitation, aggression, irritability, delirium, and psychosis.

A 2017 REVIEW BY DR. JULIA KIRKHAM AND COLLEAGUES, PUBLISHED IN *THE CANADIAN JOURNAL OF PSYCHIATRY*, REPORTED THAT "APPROXIMATELY ONE-THIRD OF ALL PERSONS WITH DEMENTIA ARE CURRENTLY PRESCRIBED ANTIPSYCHOTIC MEDICATIONS." THIS IS DESPITE SAFETY WARNINGS BY REGULATORY AGENCIES IN MANY COUNTRIES.

For example, the U.S. Food and Drug Administration issued a "black box" warning in 2005 for the use of all second-generation antipsychotics for people with dementia due to increased mortality risk. In 2008, they extended the warning to all first-generation antipsychotics as well.

Increased mortality is not the only adverse effect of antipsychotics for people with dementia, though. A recent study that involved more than 170,000 people with dementia – by Dr. Pearl Mok and colleagues, published in 2024 in *The BMJ* – found that the use of antipsychotics in dementia was linked to a wider range of serious harms than previously acknowledged in regulatory safety warnings.

Specifically, that study found that current use of any antipsychotic was associated with an increased risk of pneumonia, acute kidney injury, blood clots, stroke, heart attack, fracture, and heart failure.

"In the 90 days after a prescription, the risk was highest for pneumonia, acute kidney injury, stroke, and blood clot, with the increased risk ranging from 1.6-fold for blood clot to two-fold for pneumonia, compared with non-use," said Dr. Mok, a research fellow at the University of Manchester in England.

"In addition, not only did we discover a wider range of harms associated with antipsychotic use by people with dementia, we found that the risks were highest in the first seven days after initiation of antipsychotic treatment, with the risk ranging from two-fold for blood clot to ten-fold for pneumonia, compared with non-use, during this period. These findings underscore the need for even more caution in the early stages of using these types of drugs with this population."

TYPES OF ANTIPSYCHOTICS & HOW THEY WORK

Antipsychotic medications, also known as neuroleptics, help reduce psychosis symptoms by altering brain chemistry.

First-generation (or typical) antipsychotics reduce the amount of the brain chemical dopamine by blocking dopamine receptors. Examples include chlorpromazine, flupenthixol, afluphenazine, haloperidol, loxapine, perphenazine, pimozide, trifluoperazine, thiothixene, and zuclopenthixol.

Second-generation (or atypical) antipsychotics block dopamine, too, while also affecting serotonin levels. Examples include risperidone, quetiapine, olanzapine, ziprasidone, paliperidone, aripiprazone, and clozapine.

The newer, i.e., second-generation, antipsychotics are more widely used, although some people still use the first-generation medications.

A **black box warning** is the most serious type of warning placed on medication, used when there is reasonable evidence of a serious hazard.

Dr. Mok's study adds further support for existing policies and position statements worldwide calling for the reduction in antipsychotic use for those with dementia, including the "American Geriatrics Society Beers Criteria for Potentially Inappropriate Medication Use in Older Adults."

According to the 2023 version of those criteria, antipsychotics should only be used by people with dementia if "documented nonpharmacologic options (e.g., behavioral interventions) have failed and/or the patient is threatening substantial harm to self or others."

Further, it recommends that if antipsychotics are used, periodic deprescribing should be attempted to assess ongoing need and aim for the lowest effective dose.

So, it turns out that the answer to the question of whether antipsychotics do more harm than good is … it depends.

> ***"Although these medications can have many unwanted side effects, they can be extremely valuable for some people.***

Because there are many types of antipsychotic drugs available and the effects of these medications (both positive and negative) vary from person to person, many variables must be considered by a doctor when making an antipsychotic prescription decision.

For the people who *are* prescribed an antipsychotic, it might involve some experimentation over time to find the best medication and the right balance where the dose and duration of treatment provide optimal benefits while minimizing the adverse effects.

Can Multivitamins Slow Cognitive Aging?

UNDERSTANDING THE SURPRISING STUDY FINDINGS

Did you hear about the study that found taking a daily multivitamin provides cognitive benefits in older adults?

The study, called COSMOS-Mind (COcoa Supplement and Multivitamin Outcomes Study of the Mind), reported that taking a daily multivitamin-mineral supplement (multivitamin) reduced cognitive aging by about two years in people aged 65 and older compared to taking a placebo.

It was the first long-term, large-scale clinical trial to suggest a multivitamin may improve cognitive function in older women and men.

The results were published in April 2023 in *Alzheimer's & Dementia: The Journal of the Alzheimer's Association.*

To get the lowdown on the study and the implications of its surprising findings, Mind Over Matter® spoke with principal investigator Dr. Laura Baker, a professor of gerontology and geriatric medicine at the Wake Forest University School of Medicine, and Leslie Beck, Registered Dietician, one of Canada's leading nutritionists, Director of Food and Nutrition at Medcan in Toronto, and a member of Women's Brain Health Initiative's expert panel.

THE COSMOS TRIAL

COSMOS was a large clinical trial initiated by investigators at Brigham and Women's Hospital, an affiliate of Harvard Medical School in Boston. The original goal was to see if a daily cocoa flavanol supplement could reduce the risk of cardiovascular disease and if daily supplementation with a multivitamin could reduce cancer onset and severity in older adults.

COSMOS included 12,666 women aged 65 or older and 8,776 men aged 60 or older who were randomly assigned to four different groups: cocoa flavanol supplement plus multivitamin; cocoa flavanol supplement plus multivitamin placebo; cocoa flavanol placebo plus multivitamin; and placebos for both supplements. They took the supplements daily for three years.

THE COSMOS-MIND SUB-STUDY

Dr. Baker and her team at Wake Forest collaborated with the COSMOS study team to explore cognitive benefits in a sub-study called COSMOS-Mind. Wake Forest has a track record of expertise in conducting clinical studies with cognitive testing completed through telephone interviews – most notably for the Women's Health Initiative study, which has been researching risk factors for cognitive decline and early detection strategies for serious health conditions in older women since 1992.

For COSMOS-Mind, Dr. Baker's team administered a battery of cognitive tests to 2,262 older adults via telephone at the beginning of the study and then annually for three years. The assessments evaluated general cognitive status, episodic memory, and executive function, and included tasks such as word list and story recall, and word fluency.

About 60% of the study participants were women, with an average age of 73, and 89% were non-Hispanic White.

The investigators calculated global cognition scores for each participant based on their test results. Then, they compared scores for the cocoa flavanol groups and the multivitamin groups relative to placebo at different time points.

COSMOS-MIND FINDINGS

Surprisingly, the cocoa flavanol supplement had zero impact on global cognition, episodic memory, or executive function. "We expected the cocoa flavanol supplement would provide cognitive benefits based on the presumed benefits of cocoa flavanols for the heart and blood vessels since heart health and brain health go together," said Dr. Baker. "We were shocked when we saw it made no difference."

"However, multivitamin supplementation significantly improved global cognition, and the effect was greatest in individuals with a history of significant cardiovascular disease," she said.

THE RESEARCHERS ESTIMATED THAT THREE YEARS OF TAKING A DAILY MULTIVITAMIN ROUGHLY TRANSLATED TO SLOWING COGNITIVE AGING BY 1.8 YEARS, OR BY ABOUT 60%. MULTIVITAMIN SUPPLEMENTATION ALSO PROVIDED MEMORY AND EXECUTIVE FUNCTION BENEFITS.

"We looked for differences based on sex and found the cognitive benefits of multivitamins were the same for women and men," said Dr. Baker. "There were also no differences for any other factors, such as age and body mass index."

Next, the COSMOS-Mind team evaluated whether taking a cocoa flavanol and multivitamin supplement reduced the incidence of mild cognitive impairment (MCI) and dementia compared to placebo. Their follow-up analysis was published in *Alzheimer's & Dementia: The Journal of the Alzheimer's Association* in November 2023. Neither daily cocoa flavanols nor multivitamins reduced the risk of cognitive impairment.

"WE SAW THAT THREE YEARS OF TAKING A DAILY MULTIVITAMIN DID NOT REDUCE THE INCIDENCE OF MILD COGNITIVE IMPAIRMENT OR ALZHEIMER'S DISEASE. THAT DIDN'T SURPRISE US BECAUSE THREE YEARS OF OBSERVATION IS A FAIRLY SHORT TIME FRAME CONSIDERING IT USUALLY TAKES A BIT LONGER TO SEE BRAIN CHANGES ASSOCIATED WITH MILD COGNITIVE IMPAIRMENT AND DEMENTIA.

"However, among individuals who developed mild cognitive impairment during the study, those in the multivitamin group obtained higher cognitive scores than their counterparts in the placebo group, suggesting the multivitamins may have provided some protection or resilience to disease progression. The multivitamin didn't take the disease away but kept them performing better," continued Dr. Baker.

MORE EVIDENCE

The parent COSMOS study continued to grow, adding two more sub-studies called COSMOS-Web and COSMOS-Clinic, led by collaborating teams of investigators at Columbia University and Brigham and Women's Hospital, respectively.

For COSMOS-Web, 2,472 people responded to computer-based cognitive tests at the beginning of the study and annually for three years. For COSMOS-Clinic, 573 study participants received cognitive testing in person at the start of the study and annually for another two years.

When the investigators combined data from all three sub-studies – COSMOS-Mind, COSMOS-Web, and COSMOS-Clinic – their analysis revealed that daily multivitamins had clear benefits for global cognition and episodic memory.

They calculated the magnitude of the effect on global cognition was equivalent to reducing cognitive aging by about two years, confirming the earlier result in the COSMOS-Mind study alone. Their meta-analysis was published in *The American Journal of Clinical Nutrition* in March 2024.

SHOULD ALL OLDER ADULTS TAKE A DAILY MULTIVITAMIN?

Multivitamins are readily available and relatively inexpensive. So, should all older adults take them to protect cognitive health?

The COSMOS meta-analysis researchers were careful not to make a blanket recommendation that all older adults should take a multivitamin. Instead, they concluded in their paper that their findings warrant consideration by clinical guidelines committees.

Health Canada's Dietary Guidelines are currently silent on potential brain health benefits. The National Institutes of Health Office of Dietary Supplements hints that there may be some potential brain health benefits: "If you are 60 or older, taking a multivitamin might help maintain or improve cognitive function, memory, and related mental skills."

"THE COSMOS STUDIES WERE LARGE AND WELL DESIGNED AS RANDOMIZED CONTROLLED TRIALS WITH STATISTICALLY SIGNIFICANT FINDINGS. HOWEVER, THE RESULTS WERE QUITE MODEST, SUGGESTING THAT THE MULTIVITAMIN-MINERAL SUPPLEMENT BENEFITTED SOME, BUT NOT MOST PARTICIPANTS," SAID MS. BECK.

"There are many things we still don't know, such as what ingredients played a role in reducing cognitive aging, how they worked, and how the study results may apply to individuals from other racial groups since the study population was not diverse."

"Since we recruited from the parent trial, we were not able to achieve an acceptable level of diversity in our study," said Dr. Baker. "Therefore, we cannot say our findings apply to other racial and ethnic groups."

SUPPLEMENTS STUDIED

Mars Edge, the nutrition division of Mars Inc., provided the cocoa flavanol supplement. It contained 500 mg of cocoa flavanols, including 80 mg of epicatechins, and about 50 mg of theobromine and 15 mg of caffeine. Results from previous population studies and small clinical trials have suggested cocoa flavanols may improve memory and executive function.

The multivitamin-mineral supplement was Centrum Silver, made by Pfizer Consumer Healthcare (now Haleon). It contains more than 20 different vitamins and minerals and is only available in the United States. Haleon told Mind Over Matter® that the product most similar to Centrum Silver sold in Canada was Centrum Minis Men 50+, according to a product comparison they conducted in October 2022.

Multivitamin-mineral supplements contain all or most essential vitamins and minerals at lower levels than found in individual products. Deficiencies in certain micronutrients, such as vitamin D and vitamin B12, are associated with cognitive decline.

She added, "We don't know the safety profile of daily multivitamins for other groups or if they would benefit in the same way. We plan to seek funding to conduct a new study that includes appropriate diversity that would permit us to generalize results to the larger population."

Both Ms. Beck and Dr. Baker agreed multivitamins are not a panacea for protecting brain health and that it's still essential to eat a healthy diet, get sufficient sleep and exercise, reduce stress, enjoy social interaction, and participate in brain-stimulating activities – WBHI's Six Pillars of Brain Health.

Many experts say taking a multivitamin is unnecessary if you eat a healthy diet. However, Dr. Baker said that advice deserves context because not everyone can access nutritious food.

For people living in food deserts, areas without access to plentiful and affordable healthy foods, or food swamps, areas with a higher density of fast food and junk food rather than healthy options, multivitamins may provide a low-risk, low-cost insurance policy for addressing nutrient gaps.

"Eating a healthy diet does not necessarily guarantee *no* nutrition deficiencies. Aging and some medications can reduce the absorption of micronutrients essential for good health," said Dr. Baker.

Dr. Baker also noted, "Older adults should check to see if they have nutrition deficiencies by having a full blood panel and seek a personal nutrition evaluation with a registered dietitian."

"I routinely recommend multivitamins to clients over 50 to help them bridge nutrient gaps after evaluating their diet, and in many cases, their bloodwork results, but not for brain health," Ms. Beck said. "Nutrition guidelines do not yet recommend multivitamins for brain health benefits. It will be interesting to see if these findings or future studies may provide sufficient evidence to change guidelines."

The Many Faces of Dementia

REPRESENTING DIVERSE SAMPLES IN DEMENTIA RESEARCH

Much of our current health data and treatment strategies for dementia have been based on samples from older, white people, and may not reflect the realities, supports, and cultural considerations for diverse people with dementia.

According to the Alzheimer Society of Canada's 2024 report, "The Many Faces of Dementia in Canada," there is a pressing need to raise awareness that people of all ethnic and racial groups may develop dementia. With age as the largest risk factor for dementia, as the ethnocultural demographics of older adults shifts in Canada and other countries with high levels of immigration, these demographic changes will be reflected in populations living with dementia.

ENSURING THAT DIVERSE SAMPLES ARE REPRESENTED IN FUTURE DEMENTIA RESEARCH IS CRITICAL TO ENHANCING OUR KNOWLEDGE OF THE DISEASE AND DEVELOPING APPROPRIATE SERVICES AND SUPPORTS.

WEIRD SAMPLING

Lack of diversity in health science and behavioural science sampling is not a new issue. In a 2010 article published in *Behavioral and Brain Sciences*, Drs. Joseph Henrich, Stephen Heine, and Ara Norenzayan from the University of British Columbia coined the tongue-in-cheek acronym "WEIRD" to refer to research samples comprised of university undergraduates from Western (primarily white), Educated, Industrialized, Rich, and Democratic countries.

The authors examined research sampling practices in top-cited academic journals and found that scientific knowledge of human psychology has been largely based on WEIRD "convenience" samples, primarily from American universities.

Through a comparative analysis of findings from WEIRD samples to other samples (e.g., non-Western samples, non-university-educated Americans), Henrich et al. provided compelling evidence that "WEIRD subjects are particularly unusual compared with the rest of the species – frequent outliers."

IT FOLLOWED THAT BROAD CLAIMS ABOUT HUMAN NATURE MADE FROM WEIRD SAMPLES COULD NOT HOLD UP ACROSS DIVERSE POPULATIONS.

The authors challenged researchers to identify creative ways to include diverse samples in their work so that findings could be generalized across populations.

Another issue raised by Dr. Henrich and colleagues was that the researchers themselves who published in top-cited journals tended to be WEIRD, which influenced the types of issues that they investigated and their scientific approaches.

In a 2024 symposium organized by the Brain Resilience and Diversity in Aging and Dementia Collaboratory in Montreal, Dr. Karen Campbell, Canada Research Chair in Cognitive Neuroscience of Aging at Brock University, explained,

"WEIRD SAMPLES COLLECTED BY WEIRD LABS LEADS TO WEIRD RESULTS, AND A LACK OF UNDERSTANDING OF HOW DIFFERENT GROUPS OF PEOPLE EXPERIENCE (PHENOMENA LIKE) AGING.

Although the influential article by Dr. Henrich and his team has been cited more than 14,000 times, unrepresentative WEIRD samples and WEIRD research labs continue to hinder our understanding of human behaviour and the brain, said Dr. Campbell. One solution is to create more opportunities for trainees from diverse cultures who will then go on to become principal investigators and bring new perspectives to the research world.

Diverse research labs may also help to devise new participant recruitment strategies, build trusting relationships with under-represented groups, and minimize perceptions of stereotype threat, i.e., the fear of confirming negative stereotypes about one's group.

In Dr. Campbell's experience, recruitment methods and researcher mistrust are among the reasons why participants who opt into studies tend to be highly educated and relatively wealthy. Taking time to connect and consult with historically marginalized and racialized communities throughout the research process will assist in identifying questions that are relevant to broader populations, lead to findings that apply to a wider range of groups, and subsequently create recommendations that are useful and feasible to implement in more communities.

MANY FACES OF DEMENTIA

With more immigration than ever before, countries around the world are increasingly ethnically and racially diverse, and this diversity is starting to be reflected in dementia research. A cohort study by Dr. Shiekh and colleagues in 2020 examined the onset and frequency of dementia among global racialized populations.

Published in *Journal of Epidemiology & Community Health*, this report showed that there were significant differences in dementia risk between racial and ethnic groups, with the highest incidence reported among Black groups, similar incidence rates for Latin and white groups, and the lowest rates among Asian groups.

While some of this increased risk for dementia among Black groups related to higher rates of hypertension and diabetes, which are major risk factors for dementia, social inequalities also contributed to disease risk.

In a follow-up review published in *Journal of Alzheimer's Disease* in 2021, Dr. Shiekh and his team explained that inequalities in care seeking, likelihood of diagnosis, and uptake of treatments contributed to ethnic differences in dementia.

A 2011 systematic review published in *International Journal of Geriatric Psychiatry,* Drs. Mukadam, Cooper, and

Livingston examined why people from minority ethnic groups tend to seek care at later stages, once dementia has progressed toward moderate or severe stages.

Among the reasons for delays in seeking care were fear of shame and stigma within the community, not knowing that treatment options were available, believing that dementia was normal in the course of aging, negative experiences with healthcare providers, and believing that care was a family responsibility.

AS CLINICIANS RELY ON INDIVIDUALS AND CARE PARTNERS TO REPORT SYMPTOMS AND POTENTIAL PROBLEMS, IF SUCH INFORMATION IS NOT SHARED DURING MEDICAL VISITS, THIS CAN DELAY ACCESS TO SUPPORTS.

The authors concluded that there are real barriers for seeking help in minority ethnic groups, and more research is needed to examine the role of ethnicity and culture, and to identify when and where prevention efforts should be focused.

Ongoing research by the Canadian Centre for Economic Analysis (CANCEA) on behalf of the Alzheimer Society of Canada is helping to fill knowledge gaps on racially diverse communities and dementia.

CANCEA created the Landmark Study to examine how sociodemographic factors, like ethnic and racial diversity, impact people affected by dementia and influence the course of disease. The Landmark Study uses a microsimulation model to predict the proportion and characteristics of people who will be affected by dementia over the next 30 years.

BY MODELLING THE CHARACTERISTICS OF THOSE WHO WILL BE AFFECTED BY DEMENTIA, RESEARCHERS HOPE TO BETTER UNDERSTAND AND PREPARE HEALTHCARE SYSTEMS TO MEET THE NEEDS OF CULTURALLY AND ETHNICALLY DIVERSE POPULATIONS.

In 2022, the first report based on the Landmark Study showed that by 2050, we will have 1.7 million Canadians living with dementia, which is almost three times the number in 2020. With age as the strongest predictor of dementia, the three-fold increase is largely related to the growing number of older adults.

We will need tools for early diagnosis to increase the utility of interventions, strategies to mitigate the effects of dementia, and capacity to address the increased demand in services.

The second report, published in 2024, was titled "The Many Faces of Dementia in Canada" and predicted that the changing ethnic and racial makeup of the population will also be reflected in the rates of dementia, with the largest increase projected for people of Asian ancestry, followed by increases in people with Indigenous, Caribbean, or African ethnic origins.

Emerging research cited in the report showed that differences in biological markers (biomarkers) found in certain racialized populations may contribute to the incidence of dementia.

For example, the Apolipoprotein epsilon 4 gene has been linked to risk of late onset Alzheimer's dementia. Higher rates of this gene have been reported among Black populations when compared to white populations, while the latter group has higher rates of having the gene present than Asian and Latin American populations.

WHILE GENETIC RISK FACTORS ARE LARGELY BEYOND OUR CONTROL, THE REPORT ALSO IDENTIFIED DISPARITIES IN MODIFIABLE RISK FACTORS AND SOCIAL DETERMINANTS OF HEALTH AS KEY DRIVERS OF DEMENTIA IN RACIALIZED POPULATIONS.

Dr. Ingrid Waldron, the HOPE Chair in Peace and Health in the Global Peace and Social Justice Program at McMaster University in Hamilton, Ontario, explains, "While there are genetic components to the development and progression of dementia, social determinants, like under-education, unemployment, racism, food insecurity, and housing insecurity can lead to health disparities between racialized communities (like Black communities) and white communities more so than biology or genetics."

These health disparities in turn lead to higher rates of comorbid diseases like hypertension and diabetes, and an increase in potentially preventable dementia cases. It is therefore expected that addressing social determinants of health can create more equitable conditions for racialized communities and delay or reduce the incidence of dementia in these groups.

EXPERIENCES OF BLACK CANADIANS WITH DEMENTIA & THEIR CARE PARTNERS

Dr. Waldon's research broadly examines the social determinants of health in Black, Indigenous, immigrant, and refugee communities. Her specific interest in dementia experiences stems from personal experience as a Black woman and a family care partner for her mother with Alzheimer's dementia.

> *We have had dementia in Black communities for years, but many of us didn't know what it was. We didn't have a name for the behaviours characterized by dementia, like wandering and becoming less communicative, and previous generations did not receive an official diagnosis.*

In addition to limited knowledge on dementia in racially diverse communities in Canada, Dr. Waldron discovered that there is also limited research available on dementia experiences – of both patient and care partner – and their respective needs within Black and other racialized communities. This has hindered the creation of culturally tailored supports and services.

In an effort to explore intersections of race and dementia, Dr. Waldron convened a team of researchers to study 12 Black Canadian care recipients living with dementia and their respective care partners. Participants took part in interviews, and findings were published in a 2024 report called "The Experiences of Black Canadians Living with Dementia in the Greater Toronto and Hamilton Area and their Care Partners in Providing Care."

When asked about perceptions of cultural competency among their healthcare workers, many interviewees felt that the care they received was culturally competent, though care recipients wished to see more representation of Black people.

"Participants explained that it would have been preferable if their physician or other support workers were Black," said Dr. Waldron, and could understand where the care recipients were coming from.

Participants also shared some ideas on what culturally tailored supports and services could look like. As many care partners were relatives, they suggested that intergenerational programming activities would be ideal to strengthen relationships and improve well-being for everyone involved.

Participants were keen to learn more about how to live better and what to do to alleviate dementia symptoms. "We need to start talking about dementia and making positive changes in our lifestyle. There are things you can actually change to reduce your risk of dementia, such as improving diet and increasing exercise to prevent obesity, and stopping smoking," explained Dr. Waldron.

REDUCE VASCULAR DAMAGE TO LOWER THE RISK OF DEVELOPING DEMENTIA

In the 2024 report of the *Lancet* Commission on dementia, Dr. Livingston and colleagues provide compelling evidence that limiting vascular damage across the life course is likely to have reduced age-related dementia incidence.

High-quality data show that addressing specific health issues will likely reduce the risk of developing dementia. Specifically, individuals should seek treatment for the following risk factors for age-related dementia: vision loss, high LDL cholesterol, hearing loss, hypertension, obesity, diabetes, and depression.

There is also strong evidence to show that being physically active, maintaining social connections, and reducing smoking and alcohol consumption may help prevent dementia.

The report concludes that "evidence is increasing and is now stronger than before that tackling the many risk factors for dementia … reduces the risk of developing dementia."

> **WHATEVER WE CAN DO IN TERMS OF PREVENTION AND LEADING HEALTHY LIFESTYLES, WE SHOULD BE DOING.**

As part of future applications, the research team will devise health promotion strategies for Black communities, including creating digital resources featuring Black individuals.

"Statistics show that more and more of us will get dementia, like Alzheimer's, and it will primarily impact women. I want Black women to take dementia seriously and be able to understand the risk factors and get information on modifiable lifestyle factors to prevent this disease. I want Black women to know that there is no shame in having or talking about dementia. We need to become more aware and less dismissive," said Dr. Waldron.

Liste the Ch

THE NEED TO FULLY UNDERSTAN

& DEVICE ADDICTION ON CH

A group of students who have completed the Brainable program gathered this past summer not just to reconnect but to engage in a meaningful discussion on a topic that has become increasingly relevant in their lives: the impact of excessive social media use and device addiction on mental health.

Brainable, a Women's Brain Health Initiative (WBHI) student program, focuses on **The Brain Boosters** (the Six Pillars of Brain Health: Exercise, Mental Stimulation, Nutrition, Sleep, Social Activity, and Stress Management), underscoring the fundamental principle that healthy children become healthy adults.

Children also learn about **The Brain Busters** – the conditions and behaviours that harm brain health, including concussion, untreated mental illness, excessive social media, substance abuse, trauma, and dementia.

By June 2024, Brainable had reached more than 20,000 grade five to eight students (ten- to 14-year-olds) in 743 presentations across 14 Ontario school boards since its launch in 2021.

In April 2024, WBHI released findings from an analysis of exit slip surveys from nearly 5,000 students who took the Brainable program. Queen's University professors Dr. Heidi Cramm and Dr.

Curious to see highlights from the student discussion on social media and device addiction?

Watch them via this QR code.

en to ildren

D THE IMPACT OF SOCIAL MEDIA

HILDREN'S MENTAL HEALTH

Erna Snelgrove-Clarke conducted the research as part of the classroom education program.

UNFORTUNATELY, THE RESULTS EXPOSE TROUBLING LINKAGES BETWEEN CHILDREN'S EXCESS SOCIAL MEDIA USE AND SLEEP DEPRIVATION.

According to Dr. Cramm, PhD, OT Reg (Ont), "Screen time use, disrupted sleep, and reduced physical activity seem to be very enmeshed for students, even by grade five. By grade eight, students indicate an intention to change behaviours on multiple fronts, underscoring the complexity of the challenges they face. Awareness and education are critical in upstream approaches to promoting brain health."

Despite being aware of the imperative to cut down on screen time and prioritize restorative sleep, an overwhelming number of students are finding themselves trapped in a relentless cycle they struggle to break. The situation is urgent and critical.

For children in particular, chronic sleep loss can have profound consequences on regulating emotions, decision-making, controlling behaviour, and being less resilient to stress.

Jade Crystal, Brainable's Program Director, passionately emphasized the importance of bringing the students together, adding their voices to the conversation. While we often hear about the impact from parents and teachers, she stressed that it's crucial to listen directly to the children – to understand the true effect on their lives and understand what they believe would help them reduce the grip of social media addiction.

"After spending hundreds of hours in the classroom with students through the Brainable program, I've witnessed

NEW RESEARCH ACTION PLAN

Together with other like-minded organizations and philanthropists, Women's Brain Health Initiative is committed to funding groundbreaking research that will provide a comprehensive understanding of the impact social media and device addiction have on children's mental health. This research will provide data to help develop effective strategies to protect and support the well-being of future generations.

To help ensure the lifelong brain health of the children we nurture, on December 2, aligned with National Women's Brain Health Day, Women's Brain Health Initiative is dedicating its fundraising efforts to securing vital support for this important research.

If you believe in protecting our children's brain health by understanding the effects of excessive social media and device addiction and discovering effective strategies to empower them in navigating the digital age with resilience and strength, your support can propel this vital research forward.

It's easier to build strong children than fix broken adults.

Be Part of the Solution:
Donate Now to Support Crucial Research

first-hand the harmful impact of device addiction, especially social media, on their lives."

> **CHILDREN'S VOICES WERE OVERLOOKED IN THIS CONVERSATION, AND IT WAS TIME TO BRING THEM TO THE FOREFRONT.**

Brainable has provided these students with a unique lens through which to examine their relationship with technology. This summer gathering was an opportunity for them to reflect on their experiences and share insights on how social media and device addiction have influenced their mental well-being.

UNDERSTANDING THE ISSUE

The rise of social media has revolutionized how we communicate, share information, and connect with others. However, this digital transformation has also brought challenges, particularly for young people who are more susceptible to the allure of constant online engagement.

> **MANY STUDENTS REPORT FEELING THE PRESSURE TO MAINTAIN A CERTAIN ONLINE PERSONA, THE ANXIETY OF MISSING OUT (FOMO), AND THE NEGATIVE IMPACT OF COMPARING THEMSELVES TO OTHERS ON SOCIAL MEDIA PLATFORMS.**

Device addiction exacerbates these issues. The constant notifications, endless scrolling, and the fear of disconnecting can lead to a vicious cycle where students spend more time on their devices at the expense of real-life interactions, physical activities, and, most importantly, sleep. This addiction can contribute to feelings of isolation, depression, and anxiety, creating a significant strain on mental health.

During the summer discussion, students were encouraged to reflect on their personal experiences with social media and device use. Many shared stories of how their mood and self-esteem were influenced by what they saw online, and how the constant need to check their devices interfered with their ability to focus on schoolwork, hobbies, and face-to-face relationships.

These discussions are not only therapeutic but also educational, as students learn from each other's experiences and strategies. By sharing their stories, they realize that they are not alone in their struggles, and they gain a sense of empowerment in taking control of their digital habits.

These discussions were eye-opening and set the stage for deeper exploration through a new open call for research aimed at gaining a deeper understanding of the effects of social media and device addiction on children's mental health.

Unravelling the Impact of Social Media on the Brain

ARE OUR PHONES HELPFUL OR HARMFUL ... OR BOTH?

Here's what we know so far: research has provided valuable insights into the effects of social media on the brain, but many questions remain unanswered. To move forward, we need a deeper understanding of social media's long-term impacts, particularly on cognitive function, mental health, and emotional well-being. This is where our efforts must focus next.

Brain Canada and Women's Brain Health Initiative are teaming up to explore groundbreaking research and identify critical gaps in our understanding of how social media impacts brain health, with a special focus on children's brain development.

Together, we are committed to advancing knowledge that will shape the future of mental well-being in the digital age, ensuring we protect the next generation as they grow in an increasingly connected world.

The initial promise of social media was to connect us to friends and family, to let us build and join communities, and to bring us together. However, social media and excessive device use relates to negative trends in youth mental health.

Is the increased scrutiny on social media and devices justified by evidence? Is there still a positive role for social media in supporting well-being and brain health?

These questions need answers.

Stay tuned for exciting updates on this initiative aimed at developing evidence-based guidelines for responsible social media use and regulation. Our goal is to empower policymakers with the critical data needed to craft informed, best-practice policies that protect and support the well-being of our children.

Toward Inclusive Dementia Studies

RECENT ADVANCES IN ADDRESSING SEX & DIVERSITY GAPS

In 2024, two Canadian scientists led meetings to advance our understanding of dementia and Alzheimer's disease (AD). The first meeting summarized what we know about sex and gender differences in AD, gaps in that knowledge, and where we are going with what we currently know; the second asked what is known about risk and resilience factors in underrepresented groups in AD research. Both symposia aimed to draw attention to these inequities and map a path for future research.

SEX, GENDER, & DEMENTIA MEETING

At the first meeting, organized by the Canadian Consortium on Neurodegeneration in Aging's Women, Sex, Gender, and Dementia cross-cutting Program (CCNA-WSGD) – held in March in Montreal and tied to the Science and Partner's Day – sex and gender took centre stage. The mandate of the WSGD is to foster sex and gender in aging and dementia research.

The consensus conference/workshop Sex and Gender in Cognitive Aging: Where Are We and What's Next? was planned and organized by the Sex and Gender Champions of the CCNA, led by Dr. Gillian Einstein, WSGD Lead, professor of psychology, and the Wilfred and Joyce Posluns Chair in Women's Brain Health and Aging at the University of Toronto. It was supported by the Canadian Institutes of Health Research (CIHR) Institute of Gender and Health, Brain Canada, and Women's Brain Health Initiative.

"It was planned as a consensus meeting, because there are a lot of data – although not enough – and there was a previous meeting sponsored by the Alzheimer's Association about ten years ago, and things have really changed since then, both in the amount of research focusing on women, and our thinking on sex and gender," said Dr. Einstein.

"We see AD as a spectrum co-incident with other dementias, and we're much less binary in our thinking about sex and gender, as well as thinking more expansively about their role in both the etiology and potential treatments of dementia."

The objective of the consensus workshop was to bring together a small group of international experts, including CCNA members, to discuss the current state of sex and gender research in cognitive aging and to lay the groundwork for new research, diagnosis, and treatment directions.

"At the workshop, gender was viewed as not solely gender identity, but also gendered life experiences, including social constructs linked with being a woman or man in society (e.g., the expectation that women shoulder most of the burden of unpaid care)."

Invitees came from a variety of different disciplines and backgrounds. "We had very wide representation, including a strong presence of people with lived experience, our Indigenous colleagues, and two spirit individuals," Dr. Einstein said.

The conference opened on a unique note. "Because I really wanted to push people to think differently, there was a heavy emphasis on the arts and art-based methods," Dr. Einstein explained. This included an exhibition of an arts-based qualitative method called body mapping storytelling by women studied in Dr. Einstein's lab who have subjective cognitive decline in their early 40s, likely due to early-life ovarian removal.

SKETCHING THE PRESENT LANDSCAPE

The scientific portion of the meeting began with "talks that were really outstanding, especially keynotes from Victor Henderson and Roger Dixon laying the groundwork for what is known and quantitative methods for understanding individual variation that is inherent in including gender," Dr. Einstein said.

A few established sex and gender differences were covered:

- the high-risk *ApoE4* Alzheimer's gene appears to have a stronger impact in women than men;
- some forms of exercise are better for midlife females than males. Importantly, women benefit more from strength training because it wards off frailty, which is a big risk factor for females;
- since cognitive tests are verbally heavy, and women have better verbal skills on average, they tend to be diagnosed with dementia at a later stage in the disease than men; and
- the risk of early life ovarian removal for late-life Alzheimer's.

Panels included experts on sensory loss, Indigenous health and wellness, brain and cognitive reserve, and lifestyle behaviours, including sleep. Evidence was also presented that negative social and structural determinants of health, which women experience more than men, such

as lower socioeconomic status and less access to health care, might explain some of the sex differences seen in AD. The Reproductive Life Course panel addressed how sex-specific biology, such as menstrual cycling and pregnancy, interact with age and other known risk factors for dementia.

BRIDGING GAPS IN KNOWLEDGE

Conference attendees also discussed current gaps in our knowledge, and how to address them in future research.

"There's a lot of territory that hasn't been covered with respect to sex and gender," Dr. Einstein observed. "For example, there's been an enormous amount of work done in olfaction (which is the sense of smell) as a potential early sign of AD, but there's been almost no sex differences work done there. The same with other sensory phenomena – hearing, vision, and balance."

As with research that looks at diverse communities, going forward, sex and gender research will require designing studies in a way that will provide samples of smaller population subsets large enough to generate meaningful data.

"When you start getting away from the binary of sex and gender, the numbers start getting smaller," said Dr. Einstein, "and you start getting into the issue of what kinds of methods are available for understanding the subtleties of variation. With any underrepresented group, it's important to not just include a few in a sea of white, Western participants.

"The data from the former will be completely swamped by the latter, and we will learn nothing about these groups. As we begin to understand the range of people in the categories of male and female, as well as those who do not fit into those categories, we are going to need to be able to acquire meaningful data with small participant numbers."

A key point that arose at the WSGD conference was the lack of sex-based analysis in new drug trials. Take the example of the latest drugs for treating early-stage AD. "Some trials included sex-based analysis in their secondary/sub analyses, but weren't including it in their primary analysis," Dr. Einstein explained.

"The secondary analyses revealed that these antibodies against plaques are not as effective in females as in males. But decisions to release them to market were made on the basis of the primary analyses. This really highlighted an area of concern going forward."

"We're still encountering people who say the reason we didn't report on sex difference is that it wasn't a point of our study," she said. "How can you design a study for a condition that affects twice as many women as men and not think about that?"

KEY MESSAGES FOR RESEARCH

"The key messages to come out of the conference were strongly that it's no longer sufficient to do a clinical trial and control for sex. It's no longer sufficient to do a large database study and not consider gender influences. And it's no longer sufficient not to take into account the range of lives that inhabit the categories" across sex and gender spectrums, Dr. Einstein stressed.

> **"ALZHEIMER'S DISEASE IS MULTIFACTORIAL, AND PART OF MULTIFACTORIALISM IS INDIVIDUAL DIFFERENCES.**

Said Dr. Einstein, "One of the most encouraging things that happened was that some of the people who are not looking at sex differences said that our meeting had changed the way they look at their research. I'm hoping we see some sex and gender research coming out of their lab in the near future."

BRAIN RESILIENCE, AGING, & DIVERSITY

The question that motivated the Brain Resilience and Aging Knowledge Synthesis Symposium, held in May in Montreal was, "Why are there different trajectories in aging across different sociodemographic groups?"

For example, in North America, we know that Black and Hispanic people as well as those from other communities that experienced historical marginalization have a higher risk of AD and other dementias, noted meeting chair Dr. M. Natasha Rajah, Canada Research Chair, Tier 1, Sex and Gender Research in Brain Health, Memory, and Aging, and professor of psychology at Toronto Metropolitan University.

"Why is this health inequity prevalent in our society, and what are the social and structural determinants of health that might be contributing to these inequities?"

"The other rationale for this meeting is that we know so little in Canada because there's been such little investment and research into how communities that have been historically excluded from research are affected by brain changes associated with aging," Dr. Rajah added.

SEX VS. GENDER

According to the definitions used by the Canadian Institutes of Health Research, *sex* is a set of biological attributes, which include chromosomes, hormone levels and function, and reproductive anatomy.

Gender refers to socially constructed roles, behaviours, expressions, and identities. It influences how people perceive themselves and each other, and the distribution of power and resources in society. Gender identity exists on a spectrum, and can change over time.

> ***Since Canada has a history of being colour-blind in some ways, we didn't start collecting data on these demographic and social determinants of health variables in our health systems until recently.***

Consequently, when the authors of the CIHR Dementia Research Strategy approached the topic of health equity and how dementia affects different communities, such as Indigenous peoples, "they basically said they don't know, because we don't have the data," Dr. Rajah explained.

The meeting was really a conversation among scientists who have done work in, or are interested in the area of sex, gender, social determinants of health, race, ethnicity, and diversity – all within the context of neuroscience. "The key idea is that we are trying to understand what brain resilience is from a diversity perspective."

BRAIN RESILIENCE DEFINED

Brain resilience is part of a broader concept of brain health in aging. "Historically, we've defined brain resilience as being related to the concepts of cognitive reserve and brain maintenance.

"Cognitive reserve refers to an individual's ability to maintain higher levels of cognitive function than would be expected from the level of neurodegeneration and/or Alzheimer's-related brain pathology – that is, amyloid plaques – present in the brain," said Dr. Rajah. (These abnormal amyloid deposits are one hallmark of Alzheimer's disease.)

BRAIN RESILIENCE IS THOUGHT TO BE RELATED TO HIGHER COGNITIVE RESERVE AND MORE POSITIVE LIFE EXPERIENCES. SUCH FACTORS, INCLUDING HIGHER EDUCATION, BETTER DIET, BETTER PHYSICAL HEALTH DUE TO EXERCISE, AND LESS SOCIAL ISOLATION, HAVE BEEN LINKED TO HAVING COGNITIVE RESERVE.

"But there's also this other side – brain maintenance," Dr. Rajah added. "That idea refers to how well you are able to resist age and neurodegenerative diseases. Somehow, some individuals are able to maintain a youthful mind and brain, and don't get plaque and/or don't show neurodegeneration with age."

These two components each comprise half of a larger whole, Dr. Rajah explained. "That's the core of what brain resilience is – how do cognitive reserve and brain maintenance interact to provide brain resilience? How does someone's experience of stress and positive and negative experiences across their lifetime shape their brain as they age?"

In the U.S., for example, "there's research showing that racism is a stressor and has effects on the brain," Dr. Rajah noted, citing the work of Dr. Indira Turney, a former student of Dr. Rajah's collaborator Dr. Nancy Dennis.

Dr. Turney, now a neuroscientist at Columbia University, "is looking at how stress and racism affect brain volume. And she's seeing effects. Age-related volume declines are steeper in individuals who experience higher amounts of stress."

"Then there's the possible interaction with the environment in which you're living," Dr. Rajah said. "When you have a stress reaction, what do you go and eat? Do you live in an environment with spaces to go for a walk, where you feel safe? Or is that a stressor for you as well?"

RELATIONSHIP-BUILDING IN RESEARCH

The second day of the meeting was devoted to exploring how to make research on aging and dementia more equitable. One theme that emerged was the importance of engagement and building relationships.

"Our research teams need to include people with lived experience, community leaders from historically underserved communities, and also policymakers and knowledge users," Dr. Rajah explained.

> *There is a lot of research that the public can contribute to, and for that type of research, you really need to make sure that when you reach out to these communities, the communities feel safe.*

STEPS TOWARD IMPROVING INCLUSIVITY, REPRESENTATION

Dr. Rajah stressed that researchers don't set out to be exclusionary, but some routine practices exert that effect unintentionally. Take the example of running an ad in a magazine or newspaper focused on a specific cultural group.

"Some communities find it respectful to advertise in their own language," Dr. Rajah explained. "Even if someone needs a level of English or French to participate (in testing), you're showing you care enough to approach them in a culturally respectful manner."

THE FACT THAT MOST TESTING IS VERBALLY BASED IS ANOTHER BARRIER TO INCLUSIVITY.

Attendees also discussed how to structure studies in a way that ensures we have adequate representation of the communities we want to include.

For instance, to qualify for National Institutes of Health funding in the U.S., studies have to match the demographics of their environment. "That may mean including just one Indigenous person in the study statistically," she said. But that isn't going to make the research reflective of diverse populations, she noted.

"We need to get to a space of intersectionality," said Dr. Rajah. "To do that type of research you need really large sample sizes. If you don't have proper data, you're going to come up with all sorts of models of the world and healthcare recommendations that aren't accurate."

For instance, she said, we need data to understand things like why the average age of menopause in India is 46 versus 51 or 52 in North America. "Are these differences cultural or societal? Is there a biological component to it? We have these models of aging within the sexes that are very much oriented toward the West right now, and we don't understand how everyone else ages."

RETHINKING RESEARCH DESIGN

Other discussions centred on breaking away from traditional methods of looking at variables like race. "When you study health inequities in communities that have been historically marginalized, you don't want to 'other' them even further by comparing them to each other or to Western standards," Dr. Rajah explained. "So, how do we move away from that?"

One alternative is to consider an array of social and structural determinants of health, such as income and access to green space. "Everyone has social and structural determinants of health and environment," said Dr. Rajah.

"So instead of saying Black and white, look at that as part of a continuous variable within the person. Then you're thinking a bit more deeply about what's going on. You can study a social factor across everybody instead of clumping them into groups."

> *We have to be careful as scientists about how we communicate any differences we observe because we live in a society where this kind of information can be used in an unintended way.*

Both meetings emphasized the need for big data – including much larger Canadian longitudinal studies, similar in scale to the UK Biobank – as well as recruitment methods and analytic methodologies that can take into account individual differences.

FORGING A PATH TOWARD THE FUTURE

The teams behind both conferences plan to publish their recommendations over the coming months. Drs. Einstein and Rajah hope that the recommendations will stimulate thought and help steer cognitive aging research in animals and humans in a direction that truly reflects our population.

Drs. Einstein and Rajah are committed to bringing sex and gender as well as the diversity lens to aging and dementia research; in fact, they participated in each other's meetings.

"It's a very exciting time in neuroscience," said Dr. Rajah, because "we're now getting to a level of maturity that we could ask questions that are societally relevant."

On the Cover

WITH DOREEN McCANNELL-BOTTERILL & JENNIFER BOTTERILL

If you ask Doreen McCannell-Botterill, there's a simple explanation for why both she and her daughter, Jennifer Botterill, were the youngest members of their respective Olympic teams, just teenagers while representing Canada for the first time on the biggest stage in sport.

"It's a coincidence," Doreen says, with a smile.

The Winnipeg athlete was 16 years old when she was one of four Canadian speed skaters to compete at the 1964 Winter Games in Austria, where she was the youngest skater in the entire field. And then, 34 years later, Jennifer played for the Canadian women's Olympic hockey team in Japan, where her sport made its Winter Games debut, and the 18-year-old was her team's youngest player.

But while Doreen chalks up that shared youthful Olympic experience to serendipity, Jennifer says her mom is overlooking an important detail. Namely, her own influence.

"It was a big inspiration for me to think if my mom was able to represent Canada when she was 16, then I felt like that dream of mine to make a roster at 18 seemed attainable," said Jennifer, who won silver at her first Winter Games, and then went on to win three straight Olympic gold medals with Team Canada, which included an assist on the game-winning goal in Vancouver in 2010.

> ***"I knew there was so much work ahead, but to think of what my mom had accomplished was a constant motivation for me.***

Jennifer added, "Even though my dreams might've been lofty or ambitious, every single day I had that inspiration in front of me of what she had done."

Jennifer and her older brother, Jason, a former NHLer who now works in the Seattle Kraken's front office, had an active childhood, which was by design, thanks to their parents, Doreen and Cal. "We always believed that for children growing up, and really for everybody, it is important to find something that they love that they can do into their senior years," Doreen said. "We're firm believers in introducing children to a variety of things, so they can choose what they like, instead of just focusing on one activity. That can lead to burnout."

While she hasn't been on speed skates in a few years, Doreen remains active on a daily basis, swimming, kayaking, and paddleboarding at the family cottage in the summer months and stretching and going for long walks while at home in Winnipeg. "We go walking every day and we think it's really important to get out and enjoy nature, to be in the environment," said Doreen, who's now 77. "I always feel so much better after being outside and breathing all the fresh air. It energizes you, that's for sure."

Jennifer retired from hockey in 2010, but she's still plenty active, jogging regularly, doing yoga and callisthenics – body weight training, like push-ups, lunges, and squats. And she has hardly left hockey behind: the 45-year-old is on the ice regularly coaching her three daughters, Maya (9), Brooklynn (7), and Wyllow (5), and also on television screens across North America as a studio analyst for Sportsnet on *Hockey Night in Canada*, and a colour commentator and analyst for the NHL on TNT with Warner Brothers/Turner Sports in the U.S.

Some might think it would be natural for the daughter of a mom who was a multiple-time national champion who held more than 30 Canadian records and competed in two Olympics, and a dad who played for Canada's national hockey team to also reach the highest levels in her chosen sport. But Jennifer says she and her brother never felt pressure to follow in their parents' footsteps.

"Certainly, my parents were always about getting us involved, finding things we loved, and enjoyment was always the highest priority," said Jennifer, who managed to couple that enjoyment with incredible success, including winning five world championship titles for Canada, and earning two tournament MVP awards on that stage.

> **FOR US IT WAS ABOUT HAVING A HEALTHY LIFESTYLE, AN ACTIVE LIFE. WE HAD THAT ROUTINE FROM A YOUNG AGE ABOUT EATING WELL, BEING ACTIVE, AND DEVELOPING THOSE HABITS. MY PARENTS ALSO INSTILLED IN US THE IDEA THAT WE SHOULD *WANT* TO DO WELL, BUT WE DON'T *HAVE* TO DO WELL.**

Hockey was front and centre for Jennifer, who grew up in a Winnipeg neighbourhood called Wildwood Park, with two outdoor hockey rinks just steps away. "Every evening we would have dinner and then the kids would be off to the community club," Doreen said, and she points out that she noticed something immediately after Jennifer started playing hockey: "A smile you could see right through her cage."

"That carried through at world-championship gold medal games. Looking at my teammates, they had that same smile on their faces that my parents said they saw on me when I started with this sport," Jennifer added. "It was just these

habits and routines that started at a young age, to have a great attitude and perspective on sport, to want to be a part of it because you truly enjoy it."

Recently, Jennifer was inducted into the Manitoba Sports Hall of Fame, joining Doreen, who was inducted in 1995. Jennifer and Doreen have both been in the spotlight numerous times due to their achievements, but this Mind Over Matter® cover is their first ever photo shoot together.

It's the message Women's Brain Health Initiative supports that excites Doreen and Jennifer most about the opportunity to share their story.

"THIS MAGAZINE, THE INITIATIVE, AND EDUCATING OTHERS AND CREATING EVEN MORE AWARENESS TO MAKE SMART DECISIONS, TO CREATE GOOD HABITS AND A GREAT LIFESTYLE, THAT WAS SOMETHING THAT WE REALLY APPRECIATED.

"It's impressive how passionate they are to share the best information and the most up-to-date research in the field to make sure that women are staying as sharp and as healthy as they possibly can. And for us, if we could be connected with a good influence, an educational piece for people, you never know when one little thing might be a big health change for them and for their lifestyle," Jennifer added.

Doreen points to her grandmother, who lived to be 100, and her mother, who passed away a few months short of 100, as her role models for healthy living. "My grandmother had a garden into her 90s that she loved going out to regularly, and my mom and I swam every week until she was 94," Doreen said. "Both my mother and grandmother had very active lifestyles and a healthy balanced diet."

Jennifer has a lot on her plate these days with work and three young kids but is using lessons she learned from her family members about how to be fully present in every situation she's in, no matter how busy she gets. After a late shift in the Sportsnet studio in Toronto, for example, she'll come home and squeeze in ten minutes of yoga before bed, so she's feeling refreshed the next morning when she and her husband, Adrian, are up early with the kids.

"That's a way I know I can feel fully present, and that's how my parents were with my brother and I," Jennifer said. "I know not everyone is going to have the same family inspiration when it comes to the amazing role models that I had, but hopefully through initiatives like this magazine, they're reaching people and sharing a lot of knowledge of some of what I had access to because of my family and how incredible they were."

Doreen recalls how ahead of the 2010 Olympics, a reporter asked Cal what he'd tell his daughter before the gold-medal game if he were in the dressing room before the puck dropped. "I think I would tell her, 'Enjoy the moment,'" he replied. That same reporter asked Jennifer what she figured her dad would say to her, and she answered: "I think he would say: 'Enjoy the moment.'"

The memory makes Doreen laugh now. That's how strong the message was in their household: sport was always about enjoyment first, and if it came with success, as it did for so many members of their family, that was the cherry on top.

Bold Research Projects for Advancing Women's Mental Health

BASICS OF BETTER MENTAL HEALTH PROGRAM GRANTS 2024

Mental health conditions affect women differently than men. For example, women are more likely than men to develop anxiety, depression, and traumatic stress-related disorders. Yet only 3% of neuroscience studies are focused on women, and only about 5% include sex in the study design in a way that allows scientists to make comparisons between sexes.

Like much health research, neuroscience research has historically focused on male subjects, materials, and participants, biasing results toward the male body and men's experiences.

This has led to ongoing deficits in evidence regarding sex and gender-related dynamics in brain health and disease in females, women, and gender-diverse people.

To help address this gap, Women's Brain Health Initiative (WBHI), Brain Canada, and the Krembil Foundation, with the support of The Erika Legacy Foundation and Power Corporation of Canada, recently awarded $3.3 million in the Basics of Better Mental Health Program to three recipients and their research teams.

Basic science aims to expand knowledge and understanding, laying the groundwork for future clinical research. Each team received $1.1 million for their three-year basic science projects to investigate and discover new insights into sex-related factors or differences in mental health conditions.

"Emphasizing sex-specific factors or differences is essential for advancing our understanding and treatment of mental health conditions, ultimately paving the way for more effective interventions tailored to the unique needs of women. These studies are taking bold strides toward promoting women's brain health and well-being," said Lynn Posluns, Founder and President of WBHI.

"As Canada's leading research funder focused specifically on the brain, we are seizing this opportunity and committing to advancing the field of sex and gender brain science. The inclusion of sex-specific biological considerations is instrumental in understanding the biological roots of mental health conditions," said Dr. Viviane Poupon, President and CEO of Brain Canada.

"We take great pride in supporting these three recipients who are at the forefront of addressing sex gaps in brain research."

Mind Over Matter® met with the principal investigator from each winning team to learn more about their projects aimed at advancing knowledge about sex-specific factors or differences in depression, anxiety, and postpartum depression.

DOES INSULIN RESISTANCE PLAY A ROLE IN DEPRESSION ASSOCIATED WITH OBESITY?

Depression and anxiety diagnoses in people with obesity are approximately double in women compared to men. While social factors such as stigma and the challenges of living with obesity can lead to depression, emerging science reveals obesity-related brain changes are also contributing factors.

Dr. Stephanie Borgland, a professor of physiology and pharmacology at the University of Calgary's Hotchkiss Brain Institute, and her research team are investigating whether sex-related differences in insulin resistance might explain this disparity. "There is an urgent unmet need for new treatment strategies for depression given that most current medications lead to weight gain," she said.

Her lab studies insulin signals in a midbrain structure called the ventral tegmental area (VTA). For this project, Dr. Borgland and her team are exploring whether insulin resistance impairs the brain circuit involved in motivating responses, known as the mesolimbic system, in obese mice compared to lean mice.

The mesolimbic system involves neurons in the VTA that reach into another area of the brain, the nucleus accumbens, where they release dopamine, the brain chemical responsible for reward-motivated behaviour.

"We predict that in the context of obesity and Type 2 diabetes, insulin is no longer properly regulating dopamine–releasing neurons, and that may be contributing to the development of depression and anxiety.

An essential part of Dr. Borgland's project is developing a new biosensor that measures brain insulin levels in mouse models of depression and anxiety in real time. "If successful,

this first-ever brain insulin biosensor will allow us to measure insulin levels in specific brain areas and observe how they change during daily activities," she said. "This new technology could reveal important insights we might never learn from analyzing postmortem tissue."

Dr. Borgland and colleagues will also explore whether restoring abnormal dopamine signalling increases insulin sensitivity and improves anxious and depressive behaviour in mice.

The research team includes Drs. Marie-Ève Paquet and Rochelin Dalangin at the Université de Laval, Stéphanie Fulton at the Université de Montréal, Carrie Ferrario at the University of Michigan, and Xiaochen Bai at the University of Texas Southwestern Medical Center.

WHAT BRAIN CHANGES TAKE PLACE DURING POSTPARTUM DEPRESSION, AND HOW DO THEY INFLUENCE THE PREDISPOSITION FOR MENTAL HEALTH CONDITIONS IN OFFSPRING?

The postpartum period is the time of highest risk for new-onset depression and other psychiatric disorders in birthing parents. Up to 20% of birthing parents experience postpartum depression, which affects their health and also affects their children's brain development and mental health risk.

Similar to other forms of depression, symptoms of postpartum depression include intense sadness, lethargy, loss of interest in daily activities, and memory and thinking problems.

However, the specific timing of new-onset depression during this time gives clues to how depression arises at other time periods.

"The postpartum period is a time of huge fluctuations in hormone levels, brain chemistry, and the immune system. We also see some of those same changes with psychiatric disorders, such as depression, so it's not surprising these are times of great risk. But very few studies to date have investigated exactly what transpires in the brain," said Dr. Liisa Galea, senior scientist, the inaugural womenmind Treliving Family Chair in Women's Mental Health, and head of the Women's Health Research Cluster at the Centre for Addiction and Mental Health (CAMH) in Toronto.

Dr. Galea's lab studies how sex hormones influence brain health, with a focus on dementia and stress-related psychiatric conditions and developing tailored treatments for both women and men.

Her lab was the first in the world to create animal models of postpartum depression.

For this project, Dr. Galea and her team will explore brain areas implicated in depression using advanced technologies called spatial genomics and spatial transcriptomics. These technologies will allow them to map how brain cells change relative to other cells, such as immune cells. They will compare differences between mice during the natural pregnancy and postpartum periods with mouse models of postpartum depression.

"Our experiments seek to reveal how, when, and where postpartum depression develops in birthing parents and how, when, and where their offspring develop susceptibility to developing anxiety or depression during childhood, adolescence, and early adulthood," said Dr. Galea. "We hypothesize that mental health issues will arise in adolescence for female mice and during early childhood for male mice, similar to human patterns of mental illness."

Part of this grant involves identifying biological signals, or biomarkers, that will help researchers determine whether new postpartum depression approaches may improve responses.

This is important as there are currently only two drugs for treating postpartum depression available in the United States.

The intravenous drug Zulresso (brexanolone) must be administered in a hospital setting and requires a hospital stay of at least 60 hours. The most recently approved

drug, Zurzuvae (zuranolone), is an oral medication that can significantly improve depressive symptoms but does have some serious side effects. It is not known if either drug will be approved in Canada.

Dr. Galea and her team will evaluate potential treatments, including a novel drug called Kineret (anakinra), an approved anti-inflammatory medication used to treat rheumatoid arthritis. Their preliminary work suggests this drug may be effective in blocking certain postpartum depression processes.

The research team includes Drs. Brian Kalish at the Hospital for Sick Children and Shreejoy Tripathy at CAMH in Toronto.

WILL INSIGHTS INTO A DOPAMINE RECEPTOR COMPLEX IN THE BRAIN ADVANCE DRUG DISCOVERY FOR DEPRESSION?

The incidence of major depressive disorder is two to three times higher for women than men. Yet, there are no treatments targeted to women, and current therapies are ineffective for many people.

Dr. Susan George is a physician and consultant in endocrinology at Toronto General Hospital, University Health Network, and a professor of medicine and pharmacology and toxicology at the University of Toronto. She and members of her lab discovered a unique dopamine receptor complex in an area of the brain implicated in mood and anxiety. This receptor complex occurs with a two- to three-fold greater density in female brains than in male brains.

"The complex is found in neurons targeted by dopamine neurons within the nucleus accumbens," said Dr. George. "We were excited about this discovery and then surprised to learn that rather than boosting reward responses, it mediates aversion, generating a ceiling on reward processes."

DR. GEORGE AND COLLEAGUES HYPOTHESIZE THIS DOPAMINE RECEPTOR COMPLEX BECOMES OVERACTIVE IN MAJOR DEPRESSION.

They found that activating the complex in rats increased anxiety- and depression-related behaviours, and especially so in females. They were able to reverse these effects by blocking the complex with a small protein called a peptide, which they developed.

For their project, Dr. George's research team will validate their preliminary findings about sex-related differences in the dopamine receptor complex in female and male rat models of anxiety and depression. They will compare their insights with postmortem human brain tissue from male and female individuals with and without depression.

Dr. George and colleagues will also create a new imaging tool that will allow them to examine how the dopamine receptor complex behaves in live animals. "We anticipate this new tool will inform the future development of brain imaging technology for monitoring the complex in humans, with potential to be a biomarker and prognostic indicator," said Dr. George. "At the same time, it will help advance the discovery of new drugs for treating depression and anxiety."

The research team includes Drs. Martin Beaulieu at the University of Toronto and Junchao Tong and Isabelle Boileau at CAMH in Toronto.

SUPPORT WOMEN'S BRAIN HEALTH RESEARCH

All three investigators credited the Basics of Better Mental Health Program with allowing them to continue advancing women's brain health research.

The Basics of Better Mental Health Program 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 Foundation. Brain Canada matches the federal government's investment with contributions from its partners and donors, doubling the government's impact on brain research and ultimately improving the quality of life for people living in Canada.

To learn more about Brain Canada's mission to accelerate, amplify, and fund brain research across Canada, visit braincanada.ca.

Learn more about WBHI's research initiatives at womensbrainhealth.org/research.

Donate today to support WBHI's efforts to fund bold research that matters for women's brain health. You can find a handy donation form inside the back cover of this magazine.

In a State of Flux

COPING WITH UNCERTAINTY

If offered a new, more challenging position, some people will jump at the opportunity despite the possibility of failure, while others will cling to the comfort of their current, familiar job.

One factor that influences decisions like these is an individual's ability to live with not knowing how a situation will unfold.

Over the past 30 years, researchers have learned that a high degree of difficulty coping with unpredictable, novel, or ambiguous situations is a risk factor common to a range of different mental health challenges.

WHAT'S MORE, OVER THE PAST DECADES, LEVELS OF THIS TRAIT – KNOWN AS INTOLERANCE TO UNCERTAINTY (IU) – HAVE CLIMBED IN THE POPULATION AS A WHOLE, WHILE ARGUABLY, THE FUTURE SEEMS MORE UNCERTAIN THAN EVER BEFORE.

And many of the strategies people use to alleviate the distress of not knowing can worsen IU. On the other hand, it's possible to dial down IU levels by learning healthier ways of handling uncertainty, which in turn can improve your mental health and quality of life.

Researchers unexpectedly hit upon the concept of IU while studying generalized anxiety disorder (GAD). "The hallmark of GAD is excessive, uncontrolled worrying," said Dr. Michel Dugas, one of the scientists who coined the term IU and developed a tool to measure it. (Dr. Dugas is currently Director of the Anxiety Disorders Laboratory and a professor of psychology at the Université du Québec en Outaouais.)

In trying to understand why people worry, Dr. Dugas and his collaborators initially wondered if it might be problem-solving run amok or a problem-solving deficit. However, their experience working with clients hinted at something else.

'ALLERGY' TO UNCERTAINTY

"Research in social psychology has shown that, given a choice between a clear outcome and an ambiguous outcome, just about everybody prefers one that's clear," Dr. Dugas said.

"But what we noticed in our clinical work, and later on studied more systematically, is that some people have a much higher level of difficulty dealing with uncertainty. So while most people don't like it, really some people are almost allergic to it."

People with very high IU "can't stand sitting with not knowing – it's very uncomfortable for them," added Dr. Dugas. "That's what we're interested in, in terms of how that contributes to our understanding of worry and anxiety."

According to Dr. Dugas' definition, "it's important to distinguish uncertainty from threat, because I think that's something that's confused now in the literature," he said. While the two often go hand-in-hand (for instance, a student's distress at not knowing whether they'll pass an important exam, plus fear that a failing grade will derail their career aspirations), that's not always true.

"What we noticed in people with generalized anxiety disorder is this idea that even positive uncertainty is bad."

"They might tell their spouse no surprise birthday parties ever," Dr. Dugas continued. That said, perceived threat can exacerbate IU-related stress and anxiety, particularly in the case of "unknowable" unknowns.

"The more threat we imbue those with, the more concerned we are about those outcomes, the more problems they're likely to cause us," explained Dr. R. Nicholas Carleton, a professor of clinical psychology at the University of Regina, and author of several papers on uncertainty.

MISGUIDED CERTAINTY-SEEKING STRATEGIES

One of the drawbacks of experiencing high levels of discomfort in the face of uncertainty is that it can push people to make choices that are unhelpful in the long term.

"In the experimental research that's been done, as people's intolerance of uncertainty goes up, they're more likely to choose a known negative outcome," over a more delayed, positive one, said Dr. Carleton, "because they think at least then, they can build a plan."

This kind of decision is just one example of something that's referred to in the literature as a safety behaviour. Since people with high IU find not knowing intolerable, "they'll indulge in these safety behaviours to try to decrease their feelings of uncertainty," Dr. Dugas explained.

Other such strategies include procrastination, distraction, over-researching, constant double-checking or list-making, and seeking excessive reassurance from others.

"An example is a client who asks their spouse, 'You're not smiling much, is anything wrong? Did I do something?'" said Dr. Dugas. "And the spouse says everything's fine don't worry." This only temporarily provides relief, so the cycle repeats over and over again.

"PARADOXICALLY, THE SOLUTIONS PEOPLE USE TO HELP THEMSELVES FEEL LESS ANXIOUS END UP CONTRIBUTING TO THEIR ANXIETY AND WORRY IN THE LONG TERM.

Say someone has a panic attack and can't bear not knowing when the next one might strike, "they might rarely, if ever leave the house," Dr. Carleton noted. This kind of behaviour may cause strained relationships, which could further exacerbate their anxiety.

But what determines an individual's ability to tolerate uncertainty in the first place? "The more we started to dig into it, the more evidence there was to suggest that we

TEACH YOURSELF TO TOLERATE UNCERTAINTY

To work on improving your tolerance of uncertainty, Anxiety Canada offers the following tips:

Make a list of the behaviours you use to try avoid uncertainty, such as procrastinating, frequently seeking reassurance from others, or checking certain things over and over again.

Then rank these behaviours on a scale of zero (no anxiety) to 10 (extreme anxiety) according to how you would feel if you could not do them. Once you have a list, choose the lowest-stake tasks and start trying them without falling back on old habits.

Examples:

- **let your teen hang out with friends without calling to check up on them; and**
- **go out with your partner and have them make all of the plans.**

Finally, write down what happened following each of these experiments. For more detailed instructions, go to anxietycanada.com and search for "uncertainty."

have different levels inherently with which we can tolerate unknowns," Dr. Carleton said.

"Some of that is going to be biologically based, some is going to be socially based, and some of that is environmentally based."

"For example, if you had a very safe childhood, and you weren't worried about love, money, or basic needs, you may be more tolerant of uncertainty because your body basically accepted that the world was, in general, a safe, knowable place. In contrast, if you had a lot more difficulties, that might make you less able to tolerate uncertainty."

"To put this in a larger context, there are theories that we come into the world needing certainty because from a survival of the species point of view, it might be a good idea not to like novel and unpredictable situations too much," continued Dr. Dugas. "So the default position may be to be intolerant of what is novel, ambiguous, or unpredictable, and we need to learn to tolerate uncertainty."

That idea, he explained, suggests we need to be able to identify cues in our environment that tell us, "I'm safe."

'IMMUNOTHERAPY' FOR IU

Returning to the allergy metaphor, kids with a peanut allergy can become less sensitive to peanut protein by consuming it in small, gradually increasing doses. The same approach has been found to be effective in treating IU.

"In therapy, we help people provoke situations where they don't know how things will turn out," Dr. Dugas explains. "We have them identify where they feel that uneasiness – often people will say they feel it in their stomach – and habituate to that feeling."

"By provoking uncertainty in your life and helping you gradually learn to deal with that, you may be able to worry less and feel less anxiety."

So-called behavioural experiments are one of the main tools used in this process. These involve carrying out a prescribed activity that brings on a mild to moderate amount of distress.

"For a client who is glued to their cellphone because they're so worried they'll miss an important call, or that someone will be upset with them if they don't answer, we'll have them leave their cellphone at home," Dr. Dugas explained. "In an ideal situation, the person will get home, see that a friend called to reschedule a get-together and everything's fine – the friend's not upset."

He noted that the ideal behavioural experiment is one where things don't go well, and people learn that it's not catastrophic even if things don't go to plan.

SELF-HELP STRATEGIES

People whose struggles with uncertainty aren't sufficiently severe to require a mental health professional's help can try devising behavioural experiments to target their own individual areas of difficulty, increasing the level of challenge with each step. For example, someone who feels compelled to go to the same restaurant all the time might try going to an unfamiliar one.

"You can add skills and increase confidence by practicing with uncertainty," suggested Dr. Carleton.

Dr. Carleton believes that a ubiquitous aspect of modern living has robbed us of opportunities to routinely engage in this type of exercise in our day-to-day routine.

"Before cellphones, there were all kinds of little things we got used to accepting that we didn't know. You couldn't know where your loved one was at that exact moment or resolve a barroom debate," he said. "Over the past 20 or 30 years, we've systematically removed these tiny opportunities to practice dealing with being uncertain."

THE ARGUMENT WE MADE IN A PAPER THAT WE AUTHORED WAS THAT WE'RE SEEING THIS INCREASE IN DIFFICULTIES WITH UNCERTAINTY, AND IT MAPS ONTO THE INCREASE IN THE PENETRATION OF CELLPHONES.

"Putting down the smartphone could help a lot," to build the average person's tolerance for uncertainty, Dr. Carleton said.

A more novel approach to shifting comfort levels with the unknown was tested in a March 2020 study published in the journal *Thinking Skills and Creativity*. It involved two experiments: in each, half of the participants engaged in 20 minutes of collaborative improv thinking exercises or a matched control condition including social interactions.

Among those in the improv group, measures of divergent thinking, tolerance of uncertainty, and affective well-being improved. According to the authors,

Since improvisation involves encountering uncertainty in a non-judgmental, trusting, and mutually supportive environment, new associations developed through improv are likely non-threatening and even pleasant.

Another body of research has looked at life circumstances where even people who might normally have little problem with the unknown often experience intense distress – high-stakes situations such as waiting for breast biopsy results or news about academic placements.

One study, published in *Emotion* in 2019, found that engaging in an activity that induced "flow" or complete immersion bolstered well-being during three types of anxiety-provoking periods – such as awaiting bar exam results. (People can achieve flow during a variety of activities, such as gardening and painting. In the study, participants either performed self-reported flow activities or played Tetris.)

Flow even appeared to help people cope during the early days of COVID-19, according to a November 2020 paper published in *PLOS ONE*. Researchers recruited 5,115 people living in major Chinese cities to fill out an online survey in February 2020, which included rating their well-being over the past week, as well as two questionnaires that gauged levels of flow and mindfulness during the same period.

One notable finding: participants who had been quarantined for long periods who also scored higher-than-average on the flow scale had levels of well-being on par with people who had not yet quarantined.

BENEFITS OF INCREASED TOLERANCE FOR UNCERTAINTY

However, the benefits of learning healthy strategies for coping with uncertainty likely aren't limited to reduced distress when confronting the unknown.

Being able to maintain relative calm in specific types of uncertain situations may help facilitate learning. Dr. Joseph W. Kable, the Jean-Marie Kneeley President's Distinguished Professor of Psychology and Director of MindCORE at the University of Pennsylvania, is a decision scientist.

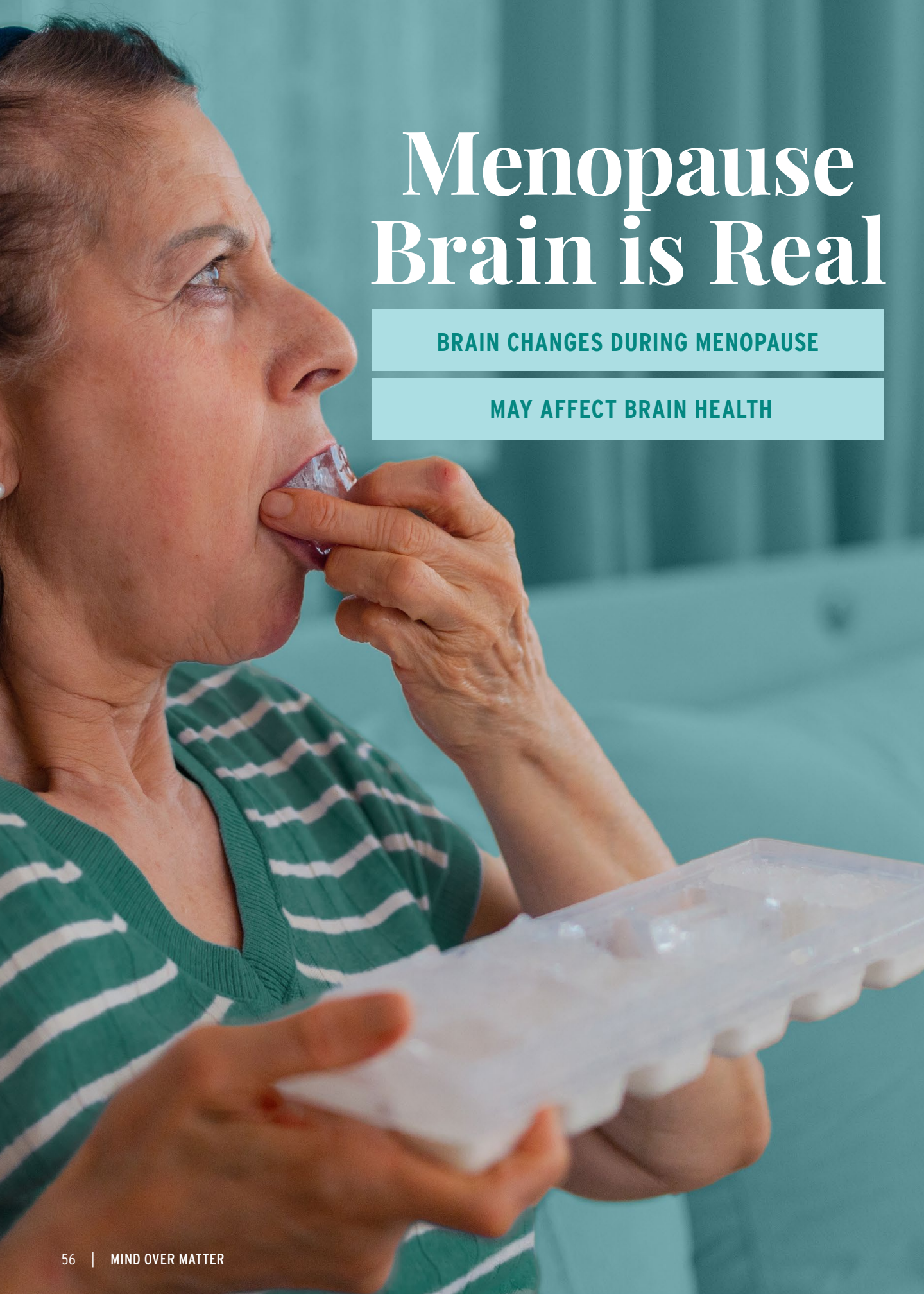
He studies how people perform on tasks involving what's known as epistemic uncertainty, which is, "uncertainty that comes from a lack of knowledge – so in theory you could know but you don't," Dr. Kable explained.

"We're looking at how the brain registers that state of 'there is something we could know that we don't know' and how it affects brain communication and behaviour," Dr. Kable explained.

"The short story is that uncertainty is a big clue to our minds that we should pay attention, seek out information, and learn. It increases arousal and seems to make brain regions more connected with each other so information can flow in a way that makes you sensitive to incoming information, as opposed to what you've learned in the past. The behavioural impact is that people do pay more attention and update their behaviour more quickly when (epistemic) uncertainty is high."

Perhaps the strongest argument for working toward greater comfort with uncertainty is that succumbing to IU is very limiting.

According to Dr. Dugas, "People don't travel. They avoid opportunities and challenge. It interferes with pleasure across almost all life domains. In our therapy, we try to help our clients move from just tolerating uncertainty to embracing it, because one of the disadvantages of not embracing it is that people don't fully live their lives."



Menopause Brain is Real

BRAIN CHANGES DURING MENOPAUSE

MAY AFFECT BRAIN HEALTH

Some women sail through menopause with no symptoms, while others experience wonky periods, unwanted weight gain, and hot flashes.

Menopause can also affect the brain. About 40 to 60% of women have cognitive complaints, including forgetfulness, insomnia, mood swings, and brain fog. Some research suggests women's brains undergo significant alterations in structure, energy metabolism, and memory circuitry during menopause – changes that do not occur in men of the same ages.

These changes have been linked with challenging neurological symptoms women actually feel, according to Dr. Lisa Mosconi, Director of the Weill Cornell Women's Brain Initiative and Alzheimer's Prevention Program at Weill Cornell Medicine and NewYork Presbyterian in New York City and author of the book *The Menopause Brain*.

> ***"Menopause is like a customized operating system update for the brain. This isn't just a metaphor – it reflects the neurobiological changes that prepare women's brains for the next non-reproductive phase of their lives.***

Mind Over Matter® rounded up the latest evidence and spoke to leading researchers about brain changes that take place during menopause and how they may affect brain health.

This article also discusses whether current treatments for hot flashes have cognitive benefits and two different treatment strategies under investigation for reducing hot flashes that may help address memory issues and potentially lower the risk of Alzheimer's disease (AD).

LOWER ESTROGEN & BRAIN CHANGES

Dr. Jill Goldstein and colleagues at Brigham and Women's Hospital and Harvard Medical School conducted some of the earliest human brain imaging research on women's brains during midlife. They explored the impact of sex and reproductive status on memory using magnetic resonance imaging (MRI).

In their study published in *The Journal of Neuroscience* in 2016, they found that lower estrogen levels in women were related to more pronounced changes in connectivity in the hippocampus – the brain area responsible for memory and learning – and poorer performance on a memory retrieval task.

They also found some good news: a subgroup of postmenopausal women with high memory performance showed similar brain activity as premenopausal women.

Other researchers have been exploring brain energy changes during menopause. "Before the menopausal transition, estrogen activates the brain's energy system, promoting glucose uptake and its conversion into energy. It also keeps the brain dependent on glucose as its primary fuel," explained Dr. Roberta Brinton, Director of the University of Arizona Health Sciences Center for Innovation in Brain Science and Regents professor of pharmacology at the University of Arizona College of Medicine – Tucson.

> **"WHEN ESTROGEN DROPS DURING MENOPAUSE, THE BRAIN IS THE FIRST ORGAN AFFECTED. THE LOSS SETS OFF A STARVATION RESPONSE, REQUIRING THE BRAIN TO REWIRE AND FIND NEW FUEL SOURCES.**

More than two decades ago, Dr. Brinton discovered that when estrogen levels decreased in mice during menopause, energy-producing structures inside brain cells called mitochondria became inefficient and made heat instead of energy. She was surprised to observe that the mitochondria in menopausal mice looked more like mitochondria in mouse models of AD than in normal mice.

MENOPAUSE FAST FACTS

- **100% of women experience menopause;**
- **menopause is a transition that occurs between the ages of 45 and 55. You are in menopause if it has been 12 months or more since your last period;**
- **three out of four women experience menopause symptoms that interfere with daily life;**
- **up to 80% of women experience hot flashes during the menopausal transition and well into postmenopause, lasting about seven to ten years, or more; and**
- **each hot flash lasts 30 seconds to ten minutes.**

WORKPLACE SUPPORT FOR WOMEN EXPERIENCING MENOPAUSE

Employers lose out when a large portion of women – 17% between the ages of 50 and 64 in the United States – quit or consider quitting their jobs due to a lack of support for menopause symptoms, according to a recent article in *Forbes*.

Savvy employers recognize supporting women through menopause confers the following competitive advantages:

- reduces absenteeism;
- helps women advance into leadership positions;
- boosts recruitment and talent retention;
- improves the company's brand image;
- reduces the risk of discrimination claims; and
- improves productivity, job satisfaction, workplace culture, and gender equality.

Read more at https://www.forbes.com/sites/michelletravis/2024/06/04/the-business-case-for-supporting-employees-through-menopause/

"Breaking the silence and the stigma of menopause at work isn't just the right thing to do, it also benefits the bottom line," according to "Menopause and Work in Canada", a new report by the Menopause Foundation of Canada.

The organization also provides an informative resource for employers under its Menopause Works Here campaign called Creating a Menopause Inclusive Workplace: A Playbook for Employers. Learn more at menopausefoundationcanada.ca.

To see if these same changes occur in women, she collaborated with Dr. Mosconi to analyze the first positron emission tomography (PET) scans of women's brains before and after menopause. They observed similar changes – a loss of brain energy and inefficient mitochondrial activity in the same brain regions as occurs in individuals with AD.

The changes were most pronounced in the postmenopausal group, somewhat present in the perimenopausal group, and lowest in the premenopausal group.

Drs. Brinton and Mosconi hypothesized that reduced brain energy during menopause might explain why women have an increased risk of developing AD compared to men.

Their paper was published in *PLOS ONE* in 2017.

In a subsequent imaging study published in *Scientific Reports* in 2021, Drs. Mosconi and Brinton found substantial changes in energy metabolism and brain structure in women's brains across all stages of the menopause transition – changes they did not observe in the brains of age-matched men.

The brain scans of 74 postmenopausal women showed the following differences compared to brain scans of 30 premenopausal women:

- lower white matter volume;
- decreased glucose metabolism in the temporal lobes, which play a role in memory and perception; and
- the presence of amyloid beta plaque deposits, with higher amounts seen in women with the *APOE-e4* gene, a genetic risk factor for AD.

THE BRAINS OF SOME POSTMENOPAUSAL WOMEN, HOWEVER, SHOWED SIGNS OF COMPENSATION, SUCH AS INCREASED CEREBRAL BLOOD FLOW AND ENERGY UTILIZATION IN SOME OF THE SAME AREAS WHERE GLUCOSE USAGE AND BRAIN VOLUME CHANGED.

Note that it's unclear whether these findings will apply to all women since 42% of the study participants were *APOE-e4* positive, much higher than the 15 to 25% of the general population with this form of the gene.

Most recently, Drs. Mosconi and Brinton discovered the density of estrogen receptors in women's brains increases significantly over the menopause transition. They observed that this increase was associated with memory lapses, mood swings, and lower scores on some cognitive tests in postmenopausal women.

"The increase in receptors is likely an ineffective compensatory response to the loss of estrogen that may result in these cognitive changes," Dr. Brinton said.

This first-ever estrogen brain imaging study assessed 54 women, divided into three groups of 18 premenopausal,

perimenopausal, and postmenopausal individuals. The findings were published in *Scientific Reports* in June 2024.

HOT FLASHES & NIGHT SWEATS

Another brain change that occurs during menopause causes hot flashes. These bothersome "personal summers" begin in specific neurons in the hypothalamus, the control centre in the brain that regulates hormone production and body temperature.

The KNDy ("candy") neurons – so-called because they produce little proteins called kisspeptin, neurokinin B, and dynorphin – become larger and fire inappropriately. This stimulates other neurons in the hypothalamus to tell the body to get rid of heat. As a result, blood moves to the skin's surface, and sweat glands release sweat.

Dr. Pauline Maki, another leading menopause research pioneer, began investigating women's brain health and menopause over two decades ago at the National Institutes of Health (NIH). She is now Director of the Women's Mental Health Research Program and Senior Director of Research at the Center for Research on Women and Gender at the University of Illinois Chicago and a member of Women's Brain Health Initiative's expert panel.

Dr. Maki also leads the largest longitudinal study of brain changes across the menopause transition as part of the NIH-funded Adult Aging Brain Connectome Project. She first reported an association between hot flashes and memory function more than 15 years ago.

Dr. Maki found that more frequent hot flashes were associated with worse memory for words.

It's important to note that her study used skin sensors to measure hot flashes and night sweats. "Women underreport night sweats on average by about 40% because they're not awake enough to realize they're happening or they're too busy trying to get back to sleep to record their data," she said.

In a subsequent neuroimaging study, Dr. Maki showed that hot flashes were associated with alterations in brain areas involved in memory. To further that work, she began a collaboration with Dr. Rebecca Thurston, Pittsburgh Foundation Chair in Women's Health and Dementia and professor of psychiatry, clinical and translational science, epidemiology, and psychology at the University of Pittsburgh, to conduct MsBrain, an NIH-funded longitudinal neuroimaging study. The MsBrain study has revealed some compelling insights.

Drs. Maki and Thurston found that women ages 45 to 67 who experienced more night sweats had more white matter hyperintensities (WMHs) in their brains, as seen on MRI, than women with fewer night sweats.

These results were published in *Neurology* in January 2023.

WMHs are small areas of damage in the brain's white matter commonly seen in brain scans of older individuals. However, an increased number of WMHs is associated with cognitive impairment, dementia, AD, and cerebrovascular disease caused by high blood pressure.

In a second study, Drs. Maki and Thurston discovered that having more night sweats during sleep was significantly associated with lower levels of amyloid beta in blood samples of women in late perimenopause or postmenopause. Lower amyloid beta in blood indicates more amyloid beta in the brain, a known AD risk factor. Their study was published in *American Journal of Obstetrics and Gynecology* in March 2024.

> **"IT MAKES SENSE THAT NIGHT SWEATS AND THE RESULTING SLEEP DISRUPTION COULD AFFECT MEMORY AND ALZHEIMER'S DISEASE BIOMARKERS BECAUSE WE KNOW THAT SLEEP IS ESSENTIAL FOR SWEEPING OUT EXCESS AMYLOID BETA IN THE BRAIN.**

"However, we don't know if the associations we discovered are causal. We hope our longer-term research underway will answer the question," Dr. Maki continued.

As their MsBrain study continues, Drs. Maki and Thurston are examining associations between night sweats and sleep disruptions with increases in WMHs and amyloid beta over ten years. They are using skin monitors to measure sleep quality and night sweats, MRI brain imaging to examine mitochondrial function, and conducting neuropsychological testing.

WILL TREATING HOT FLASHES IMPROVE BRAIN HEALTH?

There are several therapies available for treating hot flashes, including estrogen therapy, nonhormonal drugs, and alternative therapies. Estrogen therapy, for example, can effectively reduce the frequency and severity of hot flashes by 75%.

However, none of the treatments for hot flashes available today can accurately claim they provide cognitive benefits or prevent AD because there is no supporting evidence yet from randomized controlled trials, Dr. Maki advised.

"Four large, randomized controlled trials failed to find cognitive benefits associated with estrogen therapy for

women in menopause," said Dr. Maki. "However, all of these studies included women with minimal symptoms."

> *Whether estrogen therapy can improve cognition in menopausal women with hot flashes and other symptoms remains an open question.*

The North American Menopause Society issued a position statement in 2022 on the use of hormone therapy. Co-authored by Dr. Maki and Dr. Thurston, it says, "In the absence of more definitive findings, hormone therapy is not recommended at any age to prevent or treat a decline in cognitive function or dementia." It also says there is a small, elevated dementia risk for women over 65 who begin hormone therapy.

RESEARCHING NEW TREATMENT STRATEGIES

Menopause researchers are investigating different nonhormonal treatment strategies for reducing hot flashes and potentially improving brain health.

Drs. Brinton and Mosconi are conducting a Phase 2 clinical study of PhytoSERM, an oral supplement containing three plant-based phytoestrogens called genistein, daidzein, and S-equol. These ingredients were selected for their ability to promote estrogen action in the brain but not breast tissue, addressing concerns regarding breast cancer risk associated with hormonal estrogen therapy, Dr. Brinton said.

> **ESTROGEN THERAPY SUSTAINS THE UTILIZATION OF GLUCOSE IN THE BRAIN AND PREVENTS THE UTILIZATION OF OTHER FUELS. OUR DATA FROM PRECLINICAL STUDIES SUGGESTS PHYTOSERM WILL BEHAVE SIMILARLY TO PROMOTE BRAIN HEALTH WHILE ALSO PROTECTING BREAST HEALTH.**

The study is recruiting women ages 45 to 60 in perimenopause or postmenopause who are experiencing hot flashes. Dr. Brinton's team will evaluate whether PhytoSERM reduces hot flashes, measured by skin sensors, and improves sleep quality and cognitive test scores for working memory, episodic memory, verbal learning, and cognitive processing speed, compared to a placebo.

Dr. Mosconi's team will assess PET brain scans to see if PhytoSERM improves glucose metabolism. They will also analyze amyloid beta as a marker of AD risk and other markers of neuroinflammation and neurodegeneration.

Dr. Maki, on the other hand, is planning to investigate an entirely different nonhormonal treatment strategy. "Most research to date has focused on decreased estrogen at menopause as a key factor contributing to cognitive and brain aging in women," she said.

> **BUT HOT FLASHES AND NIGHT SWEATS PERSIST FOR MANY YEARS BEYOND THE FINAL MENSTRUAL PERIOD, AFTER ESTROGEN LEVELS HAVE PLATEAUED AND INTO DEMENTIA DIAGNOSIS TIME FRAMES. I HYPOTHESIZE IT'S THE PERSISTENT NIGHT SWEATS CAUSING BRAIN HEALTH ISSUES, NOT THE WITHDRAWAL FROM ESTROGEN.**

Dr. Maki said targeting hot flashes and night sweats directly is a promising approach. In a previous clinical study, she found that memory improved when hot flashes were treated with the nonhormonal therapy stellate ganglion blockade, an anesthetic injected into a nerve bundle in the neck.

"Stellate ganglion blockade reduced 75% of moderate to severe hot flashes, and memory bounced back in proportion to the therapeutic response, supporting my hypothesis," Dr. Maki said. "We are planning more trials with new nonhormonal interventions to directly treat hot flashes and night sweats."

HOW TO NAVIGATE BRAIN HEALTH CHALLENGES DURING MENOPAUSE

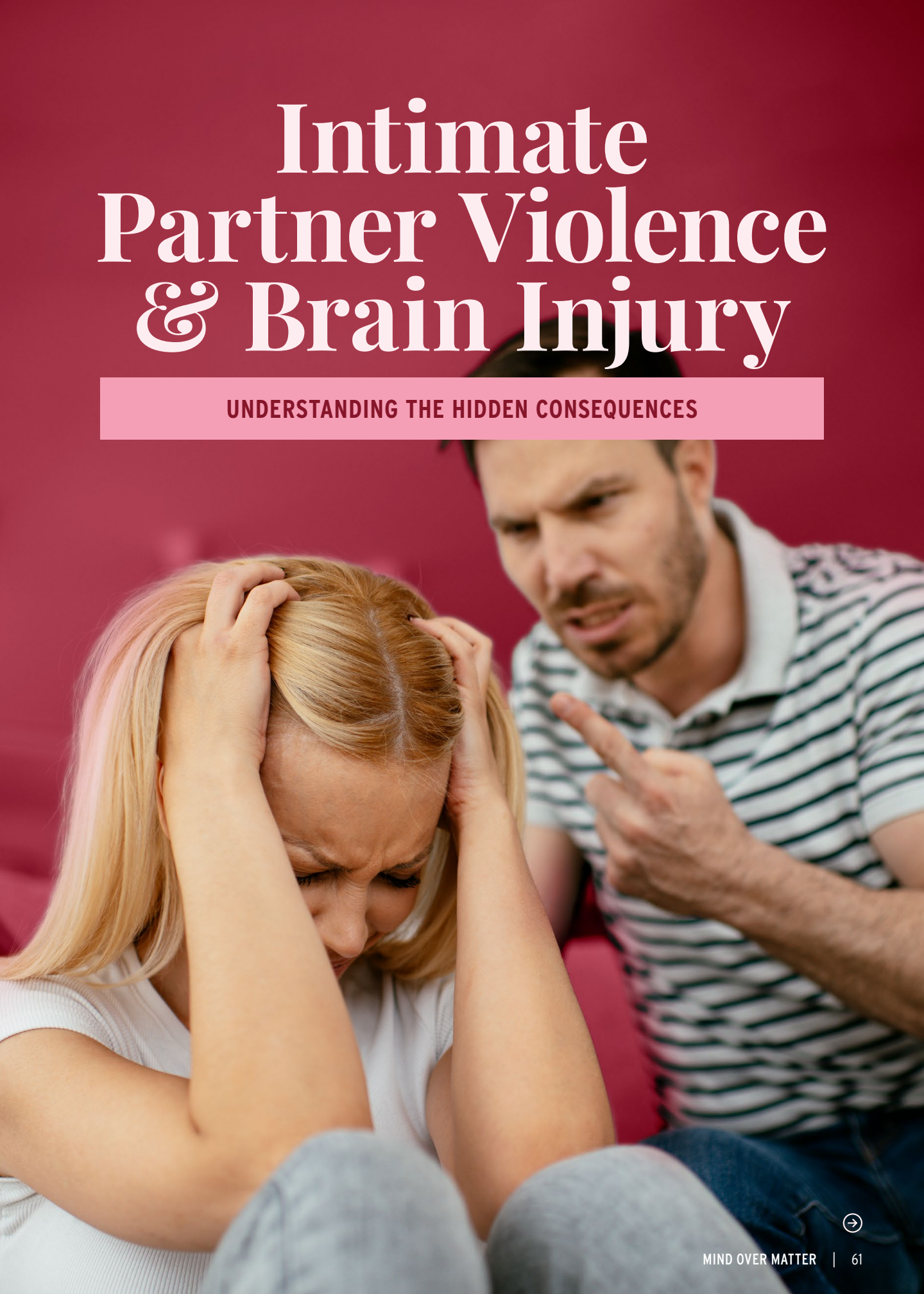
Until we have solid evidence that estrogen therapy or treating hot flashes and night sweats will improve cognitive health and reduce AD risk in menopausal women, it's essential to incorporate Women's Brain Health Initiative's Six Pillars of Brain Health into your daily life – eat a healthy diet, get regular exercise, improve your sleep habits, enjoy social activities, reduce stress, and engage in cognitively challenging activities.

"If we bring healthier brains and a higher cognitive reserve into menopause, we're going to be more resilient to developing Alzheimer's disease later," said Dr. Maki.

If you are concerned about menopause symptoms, speak to your doctor or a Menopause Practitioner. The Menopause Society provides an online search tool for finding practitioners in the United States, Canada, and other countries at portal.menopause.org/NAMS/NAMS/Directory/Menopause-Practitioner.aspx

Intimate Partner Violence & Brain Injury

UNDERSTANDING THE HIDDEN CONSEQUENCES



Brain Canada and Brain Changes Initiative recently announced $1.1 million in funding for new brain research in Canada through the Innovation Grants for Research Impact in Traumatic Brain Injury program. Two of the three recipients are focusing on an area of research that has emerged over the last decade: traumatic brain injury (TBI) related to intimate partner violence (IPV).

IPV-TBI is one of the top ten priorities in brain injury Brain Canada identified as part of a lengthy multi-step pan-Canadian stakeholder engagement exercise.

"By providing researchers with funding in this area, as well as stakeholder-informed direction on where the greatest impact can be achieved, we are helping to build much-needed evidence-based solutions that will improve brain health in Canada," said Dr. Viviane Poupon, President and CEO of Brain Canada.

CREATING A SUSTAINABLE ECOSYSTEM OF CARE FOR WOMEN WITH TBI

Dr. Carolina Bottari, a professor in Université de Montréal's School of Rehabilitation and researcher at the Centre for Interdisciplinary Research in Rehabilitation of Greater Montreal is a recipient of the Innovation Grant who has been raising awareness of the consequences and outcomes for women who have traumatic brain injuries (TBI) as a result of domestic violence.

Grounded in her expertise as an occupational therapist, Dr. Bottari and her team will take a unique approach that involves working closely with staff at second-stage women's shelters in Quebec where the priority for admission is given to women with children.

In contrast to first-stage women's shelters (i.e., emergency shelters), where women may stay post-separation for a maximum of three months, second-stage shelters provide transitional housing for one to two years. This extended period provides some stability and presents an opportunity for shelter workers to screen for TBI and create post-screening assistance that is sensitive to their needs and circumstances.

"A brain injury is a brain injury, whether it happens in the context of intimate partner violence or sports or a fall, and the consequences are the same, but the responses to similar injuries with different causes couldn't be more different," explained Dr. Bottari.

Women who experience intimate partner violence are at very high risk of having repetitive brain injuries that can lead to scarring in the brain.

In sports injuries, protective equipment and concussion protocols are in place to prevent brain injuries and ensure a safe return to play.

In the context of women with violent partners, there is no protective equipment, often no medical team, and generally no opportunity to be guided on the path to recovery by a rehabilitation team, shared Dr. Bottari.

Although evidence highlights the importance of early TBI diagnosis and intervention to minimize adverse outcomes, women who have experienced partner violence do not typically go to the hospital for diagnosis or to rehabilitation clinics for treatment and only seek help after repeat trauma, if ever.

In many cases, a woman who has had a brain injury from partner violence is not able to seek medical treatment, noted Dr. Bottari. She may have memory loss and trouble organizing her thoughts, and damage to the parts of the brain involved in decision-making. All of this poses challenges for her to assess the severity of the situation in which she finds herself and to seek help, over and above the fear and need to ensure her own survival and that of her children if she is a parent.

ANOTHER KEY CONSIDERATION IS THAT THERE IS RARELY A WITNESS OF CONCERN IN CASES OF DOMESTIC VIOLENCE.

"If you see your child get kicked in the head in a soccer game, you are a positive witness and you will take them for medical attention. If an aggressor is the only witness to the brain

Traumatic brain injuries (TBI) may result from direct trauma, like blows to the head, or from indirect trauma, like choking, which cuts off blood flow and oxygen to the brain. Both direct and indirect head trauma destroy brain cells and can affect brain function and memory.

Even mild brain trauma, commonly referred to as a concussion, can temporarily affect brain functioning and lead to severe outcomes if traumas reoccur. For this reason, there are concussion protocols in place for sports and other high-risk activities that include close monitoring, rest, and slow return to activity.

injury, there is no witness of concern to seek help for the victim," said Dr. Bottari.

Women in shelters are going through a number of physical, emotional, and social challenges, and there is currently no clear path to knowing what to do next if there is a positive screen for TBI.

"We are beginning to understand that we need to be slow and careful in our approach to women victims of violence. What we really don't want is for a positive screen for brain injury to be weaponized against the women," said Dr. Bottari. "We need to consider whether having a positive screen will help women get the services they need or increase their risks – including losing custody of their children if they are a parent. We want to make sure that we don't do more damage than good by putting TBI screening and post-screening interventions in the shelters."

By mapping out a network of care that includes members of the criminal justice system, social justice system, and healthcare system, Dr. Bottari and her team hope that this work will serve as a first step to compel members to form an "ecosystem of services" and think about their potential roles and opportunities to support recovery for women who have experienced partner violence.

While criminologists, social workers, and educators routinely work in shelters, occupational therapists are not currently part of the service network of women's shelters in Quebec.

A natural extension of Dr. Bottari's project is advocating to address this service gap. Occupational therapists analyze people's ability to carry out everyday activities in a real-world environment and propose interventions to facilitate their overall autonomy. For example, if the TBI has caused increased sensitivity to light and noise, the occupational therapist can help identify strategies, like dimming the lights and scheduling rest periods and supervised child care, so that the women can recover better from their injury.

Preliminary explorations by students in Dr. Bottari's group have demonstrated that occupational therapists can help women in shelters understand the repercussions of their injuries and learn new strategies.

"The goal of an occupational therapist is to increase someone's independence in their everyday activities secondary to any sort of injury," shared Dr. Bottari. For women in these shelters, these strategies can provide hope and a way forward to rebuild their lives.

"As a society, we need to be more cognizant of the consequences of brain injuries on women experiencing physical violence. What we're trying to do in our research work is to sort out a way to bring TBI rehabilitation to these women and integrate more knowledge about TBI throughout the shelters to improve their awareness of both TBI and strategies to limit the impact of these injuries on their everyday activities" said Dr. Bottari.

IMPROVING THE DETECTION OF BRAIN INJURY IN IPV PATIENTS

Dr. Sandy Shultz, a neuroscientist and professor in the Faculty of Health Sciences and Human Services at Vancouver Island University in British Columbia and the Director of the newly established Centre for Trauma and Mental Health Research, was awarded an Innovation Grant in collaboration with Island Health, a forensic nursing examiner team, researchers at the University of British Columbia, and an outpatient clinic for IPV survivors.

"Through this program, we are committed to advancing TBI research, knowledge translation, awareness, and support. Our work will improve our understanding and treatment of TBI, bridging the gap between research and medical practice," said Dr. Matthew Galati, founder of Brain Changes Initiative.

Funds from the grant will be used to develop a two-pronged screening approach for detecting TBI in people who have experienced IPV. As a first step, his team will develop a screening tool that is easy to use by a wide range of individuals, including first responders, clinicians in emergency departments, community workers, and shelter workers.

In the second step, this tool will be validated against a blood test that looks at elevated proteins associated with a brain injury for people who have experienced IPV to ensure that the screening tool is reliable for detecting TBI.

AS BLOOD TESTS ARE NOT ALWAYS FEASIBLE TO ADMINISTER IN COMMUNITY SETTINGS, HAVING A VALIDATED SCREENING TOOL WILL IMPROVE THE DETECTION OF TBI SO THAT MORE RESOURCES AND SUPPORTS CAN BE MOBILIZED.

The screening tool will be developed as part of a larger collaborative research program. "We have consulted and

will continue to consult with people with lived experience so that they can give us input on whether they would be willing to answer these questions and how we can ask them so that they are not triggering," explained Dr. Shulz. "We will also consult with people who will be administering the test to know whether it is practical and something they can do in their work."

When looking at brain injuries, both male and female brain cells release the same proteins that can be detected with a blood test; however, there may be differences in willingness to report symptoms that could be relevant to the screening tool. For now, Dr. Shultz's work will focus on women, as they are the primary group affected by IPV, but he hopes to have representation from all gender identities as the research program grows.

EMERGING EVIDENCE SUGGESTS IPV-RELATED BRAIN CONCUSSIONS, SPORTS CONCUSSIONS, AND BRAIN INJURIES FROM MOTOR VEHICLE ACCIDENTS HAVE SOME BLOOD MARKERS IN COMMON; HOWEVER, STRANGULATION FROM IPV MAY RESULT IN UNIQUE CHANGES IN THE BLOOD.

"Strangulation is different than a trauma to the head because it restricts oxygen and blood supply. We might be able to detect new changes in the blood that are specific to IPV strangulation that reflects a hypoxic type of injury," said Dr. Shultz.

AN UNEQUAL IMPACT

According to a review by Drs. Kellianne Costello and Brian Greenwald published in *Brain Sciences* in 2022, IPV disproportionally affects women, with one in three women experiencing IPV in their lifetime compared to 14% of men.

Studies they looked at in the review have also shown that there is a cyclical relationship between TBI and domestic violence. Someone with a TBI from domestic abuse may suffer from mood irregularities, cognitive dysfunction, and memory loss, which further frustrates the aggressor, triggering subsequent abuse and repetitive head injuries.

Moreover, the true prevalence of TBI for those who experience domestic violence is unknown, as many cases go unreported. Even so, research cited by Drs. Costello and Greenwald estimates that 11–12 times more women have had a TBI from domestic violence when compared to TBIs documented in military personnel and athletes combined.

If blood changes related to strangulations can be detected, this would have a significant impact as it would create objective evidence that is useful in a court of law. With future improvements in blood analysis technology, it may even be possible to retrospectively analyze frozen samples or small blood samples stored on paper, and trace brain injury that is attributed to violence rather than other mechanisms.

Having this knowledge can also provide another benefit, noted Dr. Shultz.

> ***A common thread that has emerged in our interactions with individuals who have experienced IPV is that understanding that the brain injury could be causing some of their symptoms seems to have a therapeutic impact. There is almost a sense of relief or validation when someone becomes aware that some of the issues that they are struggling with are because of a brain injury.***

The team plans to implement the screening tool once it is validated, for immediate benefit while waiting for subsequent research elements to be completed.

Periods of increased stress, whatever the cause (e.g., economic stress, environmental stress, stress from COVID-19 lockdown), align with an increase in cases of intimate partner violence. Increasing awareness of the triggers for IPV, improving detection of TBI, and ramping up subsequent services will help to reduce the impact of brain injuries for people experiencing intimate partner violence.

"We know that brain injuries have long-term repercussions that impact a person's ability to function and impact their quality of life. Everything we are doing in care right now is reactionary, but it would be great to be able to harness the knowledge that we gain on prevalence from this project and use that to advocate for more prevention, more education, and more resources," said Dr. Shultz.

Sharing Their Story

ONE FAMILY AIMS TO PROVIDE SUPPORT TO THE CHINESE-CANADIAN COMMUNITY BY OPENING UP ABOUT THEIR DEMENTIA EXPERIENCE

Olivia Vong was in her element. Looking every inch the successful real estate broker she'd been for many years, she was speaking with confidence and verve to a rapt audience at CIBC Square in the heart of Toronto's financial district. The subject was her daily exercise routine at age 87.

"I get up early and then I go out to walk one hour. Evvvery day," she said, jabbing a finger in the air for emphasis. "Non-stop!"

Sitting beside her was her only child, Jacqueline, who was there to share another side of their lives together. Her mother, who she describes as "gorgeous and fashionable," a vigorous and self-reliant person who had cared for others for much of her life, was starting to have memory lapses.

"We are navigating this right now," said Jacqueline, voice cracking as she grasped Olivia's hand.

"We've noticed that she's had quite a few changes. My worry is acknowledging it and aging her because she's been so proactive about prolonging her aging process."

The setting was a Women's Brain Health Initiative event titled *At Your Side, Unlocking Wisdom: Heartfelt and Candid Insights from Caregiving Experts*. Olivia and Jacqueline were sharing their personal story alongside a panel of professionals.

They were speaking about a pressing issue. According to Statistics Canada, in 2022, there were 13.4 million people aged 15 and older providing care for family or friends. Overwhelmingly, the caregivers are women, often in the sandwich generation – looking after a frail parent while also raising children.

A FAMILY AFFAIR

Coping with dementia has been a multigenerational sandwich experience for the Vongs. As a teenager, Olivia immigrated to Canada from Hong Kong, following her older sister Ming. They were later joined by five siblings and Olivia's mother, King Wah Lee, and father, Chung Lee.

After Olivia's marriage broke up, she moved in with Ming and their parents in what became the central home for the family. King Wah Lee lived to the age of 101, and for about the last decade of her life, had dementia, with the sisters coping with ever-escalating demands of care.

"IT WAS VERY CHALLENGING. SHE FORGOT THINGS AND DIDN'T KNOW WHAT SHE WAS DOING. WE STARTED TO TAKE TURNS FEEDING HER, WALKING HER, AND LOOKING AFTER HER.

Ming would take care of her mother during the day, and Olivia would take over after returning home from work. They managed to obtain caregiving help a couple of days a week, but the burden was great and growing.

"She was such a strong woman," recalls Jacqueline of her grandmother. "But she started talking in loops. She would wander, sometimes going to a local Chinese restaurant where they knew her. She'd order her regular meal, and they'd call us to come pick her up and settle the bill."

As King Wah Lee's memories disappeared, Jacqueline found that she would remember the words to an old Cantonese nursery rhyme, a poignant reminiscence from earlier times. "That was the only thing she would respond to because she did lose a lot of cognitive functions. But she would always perk up whenever we sang it and remember every word."

Finally, Olivia and Ming made the difficult decision to place their mother in a care facility, where she spent the last couple of years of her life. Then, a few years after her passing, dementia moved into their generation. Ming started to become forgetful and Olivia found herself once again a caregiver, this time for her sister. It went on for several years until Ming suffered a fall.

More recently, the woman who had cared for her mother and sister was showing her own cognitive issues and was in need of support.

She would show up at her lawyer or accountant's office without a scheduled appointment and then be confused about why she was there. She would repeatedly ask Jacqueline and her family the same question about whether they had eaten.

Meanwhile, Olivia often auditioned for commercials but increasingly had trouble memorizing short lines or directions. She would misplace shopping lists and end up buying duplicates, leaving the household with excess supplies of eggs, soap, and moisturizer.

It became evident that living on her own was too much for Olivia, so she moved in with Jacqueline, who was raising two children, aged five and seven. Jacqueline now found herself in the sandwich generation.

She ultimately arranged for her mother to move into a retirement home after she realized that "I'm not the best-equipped caregiver for my mom," not with all the other obligations of running her own business and raising two young children. It came only after an intense conversation.

> *In Chinese culture, there is a strong emphasis on filial piety – the duty of children to care for their parents.*

Jacqueline continued, "While this can lead to strong family support networks, it can also place a significant burden on caregivers, especially if they lack external support or resources. The challenge of providing care, coupled with societal expectations, can contribute to the stigma, making families more reluctant to seek help or support."

TAKING ACTION TO SUPPORT BRAIN HEALTH

In the midst of this cascade of challenges, Jacqueline was scrolling through social media late one night and came upon a notification for a Women's Brain Health Initiative (WBHI) event on preserving brain health through physical activity. She signed up, attended, and afterwards introduced herself to the Founder and President, Lynn Posluns, who was impressed.

"Both Jacqueline and Olivia have compelling stories to share," said Ms. Posluns, which is how the Vongs were invited to speak at the next caregiving-focused event, where their experiences made a powerful impact on the audience.

> *Their stories offered comfort and solidarity to others facing similar situations, showing them that they are not alone.*

Almost by accident, Jacqueline and Olivia found themselves getting involved with WBHI's work and becoming advocates for women's brain health and early detection of dementia.

They are focusing on the Chinese-Canadian community, where they say there is an element of stigma associated with dementia and a reluctance to speak about it or seek help.

"If they talk out, they feel so ashamed, they don't want to spread the information," said Olivia. Jacqueline explained in an interview with Mind Over Matter® that the Mandarin characters for Alzheimer's disease have negative connotations.

A 2014 article published by a Chinese-American geriatrician and a Chinese-American gerontology researcher in the journal *Health Affairs* told a vivid story that highlights the issue:

"Mr. Shi," we said softly in Mandarin, "after careful evaluation and assessments, we suspect that you may have Alzheimer's disease, a common form of dementia. But we can work through this together..."

"What?" Mr. Shi cried out in Chinese, interrupting us. "Wǒ-zhēn-de -dé -le-chī-dāi- zhèng?" "Am I really crazy and catatonic?" he'd asked.

The Chinese term for "dementia" is literally translated into two characters: the first means crazy and the second catatonic.

Jacqueline and Olivia are working with the University of Waterloo and the Schlegel-UW Research Institute for Aging to create a program aimed at Chinese-language speakers. It will focus on the Six Pillars of Brain Health: exercise, mental stimulation, nutrition, social activity, sleep, and stress management.

The team plans to launch it through the Yee Hong Centre for Geriatric Care in Mississauga, Ontario, with facilitators leading participants through 16 sessions (or eight weeks) of exercise and shared learning, where they talk about the pillars and promote an open dialogue about dementia.

"It's fantastic. I hope all the information we give out will help the community," said Olivia.

Ms. Posluns says it is an important initiative:

> *By telling these stories, they can empower other Chinese families facing similar challenges, showing them that there is strength in sharing experiences and seeking support.*

"We're not going to stop. There's a need for more education," said Jacqueline. Within a matter of a few whirlwind months, the Vongs found that their private, personal struggles had led them into public advocacy. Stepping onto that stage at CIBC Square was a big moment.

"My mother said it was the best day she's had in a long time because it was something that she was very afraid to do," said Jacqueline. "Afterwards, she felt that it was very rewarding because she felt like she made an impact."

SERVES 8 AS AN APPETIZER

Overstuffed Mini Peppers

Superfood Fact:
Chickpeas are a high-protein legume and a wonderful source of vitamins, minerals, and fibre to help keep your brain healthy.

INGREDIENTS

MASALA PEANUTS

- 2 tbsp chickpea flour
- 4 tsp water
- 2 tsp avocado oil, or other neutral oil of choice
- 2 tsp paprika
- 1/2 tsp ground turmeric
- 1/2 tsp ground cumin
- 1/2 tsp salt
- 1/2 tsp cracked black pepper
- 1/2 cup/56g raw or roasted unsalted peanuts or cashews
- 10 oz/280g mini sweet peppers/capsicums (8–10 peppers), halved lengthwise with stem intact and seeded

CHILI-GARLIC MUSHROOMS

- 2 tsp olive oil
- 8 oz/225g white mushrooms, finely diced or blitzed in a food processor
- 2 tsp minced garlic
- 3/4 tsp fine sea salt
- 1/4 tsp red chili flakes
- 1 cup/112g goat cheese, crumbled
- 1 tbsp chopped cilantro/fresh coriander

To Veganize: Use ½ cup/40g nutritional yeast instead of the goat cheese (but mix it in with the mushrooms instead of the peanuts so that it blends more easily).

INSTRUCTIONS

1. Preheat the air fryer to 350°F/180°C or oven to 400°F/200°C.

2. Mix together the chickpea flour, water, oil, paprika, turmeric, cumin, salt, and black pepper in a bowl to make a thick marinade. Add the peanuts or cashews and mix. Try to ensure that all the peanuts or cashews get coated with the paste. Lightly spray the air fryer base with oil and spread the nut mixture evenly on the base, or spread the nuts on a parchment-lined baking sheet (you can also lightly spray the parchment). Air fry for 5 minutes, tossing halfway through, or bake for 12–15 minutes, turning over halfway through (you may need to use a spoon to scrape the nut mixture off the parchment), until golden brown. Remove from the air fryer or oven and let cool (leave the air fryer or oven on). The nut mixture will stick together. Once cool, finely chop or pulse 3–4 times in a food processor and set aside.

3. Place the mini peppers on the air fryer base or spread on a baking sheet. Spray lightly with oil if desired, and air fry for 5–6 minutes or bake for 10–12 minutes, flipping halfway through, until the peppers are soft. Let cool until you can hold them, about 5 minutes.

4. Meanwhile, for the chili-garlic mushrooms, heat a medium skillet over medium heat. When hot, add the olive oil, mushrooms, garlic, salt, and chili flakes and cook, stirring occasionally, until the mushrooms are tender, about 5 minutes.

5. Combine the nuts with the crumbled goat cheese. Stuff each mini pepper with the mushrooms, then top with the nut-cheese mixture (press the mixture down; you want to overstuff these!). Garnish with the cilantro and serve immediately.

Superfood Fact:
Cauliflower, a cruciferous vegetable, is packed with essential nutrients that offer numerous health benefits, particularly for brain health, and is low in calories and carbohydrates.

Loaded Cauliflower Soup

SERVES 2-3

INGREDIENTS

- **1 tbsp olive oil**
- **2 small Indian green chilies, jalapeño peppers, or Thai chilies, slit lengthwise**
- **2 tbsp grated ginger**
- **1 tbsp minced garlic**
- **3 cups/750ml water**
- **1 medium head cauliflower (1 lb 5 oz/600g), leaves and stem trimmed, roughly chopped**
- **1/4 cup/28g raw cashews**
- **1/4 cup/30g yellow moong dal or split red lentils, soaked for 30 minutes, rinsed, and drained**
- **1 tsp salt**
- **1/2 tsp ground turmeric**
- **2 tbsp lemon juice**
- **1 tbsp chopped cilantro / fresh coriander**
- **1/2 tsp cracked black pepper**

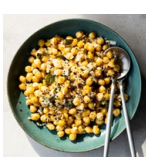
INSTRUCTIONS

1. Heat the oil in a medium saucepan over medium heat. When hot, add the green chili, ginger, and garlic and sauté until fragrant, 1-2 minutes.

2. Add the water, cauliflower, cashews, moong dal, salt, and turmeric and mix well.

3. Bring to a boil. Reduce the heat, cover, and simmer until the lentils are fully cooked and the nuts are soft, 20-25 minutes. You can also pressure cook the mixture until done (15 minutes on high pressure, natural release in an Instant Pot).

4. Blend the mixture until smooth with an immersion blender. Stir in the lemon juice, garnish with cilantro and black pepper, and serve.



For chef tips or to discover more brain-healthy recipes by Vasudha, scan here.

MEMORYMORSELS®
— A WOMEN'S BRAIN HEALTH INITIATIVE —

This edition's recipes are courtesy of Vasudha Viswanath, author of *The Vegetarian Reset* and the founder of *We Ate Well*.

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

@V8WELL

Brain Buzz®

CONTINUING SUPPORT FOR WBHI AND WOMEN'S BRAIN HEALTH

SEPT 2024
PRESENTED BY CIBC

FROM HER LIPS TO OUR EARS

(Top Row) Dominika Malycha, JoAnne Korten, Brenda Dee, Dr. Vivien Brown
(Bottom Row) Patricia Arquette, Lynn Posluns, Mark Lash, Jackie Goldman, the Honourable Lisa Raitt

JUNE 2024
PRESENTED BY
RBC WEALTH MANAGEMENT

HEALTHY BODIES, HEALTHY MINDS

(Top Row) Dr. Vivien Brown, Lynn Posluns, Dr. Patrice Lindsay, Dr. Monique Bertrand, Dr. Liisa Galea
(Bottom Row) John Hamilton, Anthony Maiorino, Siân Canavan, Leanne Kaufman, Vijay Parmar, Kelly Scrivens

APRIL 2024
PRESENTED BY CIBC

AT YOUR SIDE

Dr. Erna Snelgrove-Clarke, Olivia Vong, Jacqueline Vong, Stephanie Muskat, Lisa Sundarsingh, Jade Crystal, Natalia Farquhar, Nancy Bramm

WOMEN'S BRAIN HEALTH INITIATIVE
BOARD OF DIRECTORS & OFFICERS

Jeffrey Beach
President & CEO,
Asthma Canada

Jeanne Beker*
Journalist, Author &
Fashion Entrepreneur

Nancy Bramm
Vice-President, Inclusion
Projects, CIBC

Dr. Vivien Brown
MDCM, CCFP, FCFP, NCMP,
Assistant Professor,
University of Toronto

Brenda Dee
President, Brenda Dee &
Associates Inc.

Catherine Delaney*
President, Delaney
Capital Management Ltd.

Terrie-Lynne Devonish*
Chief Legal Officer & Corporate
Secretary, Altus Group

Arlene Dickinson*
CEO, Venture
Communications

Janice Fukakusa*
Corporate Director & Chancellor,
Toronto Metropolitan University

Mark Girard
CFO, Cedarpoint
Investments

Susan Hodkinson
Founder & Managing Consultant
HodkinsonHR

Catherine Hunter
Partner, Consumer Health
& Life Sciences, Technology
Transformation, EY Canada

Leanne Kaufman
President & CEO,
RBC Royal Trust

JoAnne Korten
Executive Director,
Women's Brain Health Initiative

Mark Lash
Founder & President, Mark Lash

Nancy Laughton
Former Managing Director,
LHH Knightsbridge

Rosie MacLennan*
Olympic Gold Medalist

Dominika Malycha
Senior Vice President Team Lead
Risk Management Practice, Aon

Heather Reisman*
Founder & CEO, Indigo

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

Ellen Rachlin (U.S.)
Former Managing Director,
J.P. Morgan

Dr. Erna Snelgrove-Clarke
Vice-Dean & Director, School of
Nursing, Associate Professor,
Queen's University

Fran Sonshine*
National Chair, Canadian Society
for Yad Vashem

Kirstine Stewart*
World Economic Forum
Executive Committee

Will Stewart
Public Policy & Communication
Strategist

*Honorary

SUPPORT WOMEN'S BRAIN HEALTH INITIATIVE AND CHAMPION THE BRAIN HEALTH OF WOMEN, CARE PARTNERS, AND THEIR FAMILIES. YOUR CHARITABLE DONATION CAN FURTHER INTENSIFY OUR IMPACT, ALLOWING US TO REACH MORE & TEACH MORE.

Women's Brain Health Initiative

Yes! I'd like to support Women's Brain Health Initiative now with my gift of:

☐ $2,000 ☐ $1,000 ☐ $500
☐ $250 ☐ $100 ☐ Other $_____

☐ I have enclosed a cheque payable to Women's Brain Health Initiative

☐ I prefer to use my credit card

You can also donate online at
womensbrainhealth.org/donate

DONOR NAME

ADDRESS

ADDRESS

CREDIT CARD NUMBER

EXPIRY DATE: MM/YY

CVD

NAME ON CREDIT CARD

PHONE NUMBER

E-MAIL

SIGNATURE

30 St. Clair Avenue W., Suite 900 | Toronto, Ontario | M4V 3A1 | 1-877-927-2011 | info@womensbrainhealth.org

Age with Audacity

Women's Brain Health Initiative

Charitable # 80099 3206 RR0001 | 501(C)(3) | Tax-exempt organization

UNTIL THERE'S A CURE, HARNESS THE POWER OF PREVENTION.
PROTECT MORE MEMORIES. DONATE TODAY.

WBHI.ORG

Women's Brain Health Initiative is a leader in providing research and evidence-based strategies to empower women to protect their cognitive health.