

THE OFFICIAL
MAGAZINE OF
THE CENTRE
FOR STUDIES
ON HUMAN
STRESS

The Centre for Studies on Human Stress is dedicated to improving the physical and mental health of individuals by empowering them with scientifically grounded information about the effects of stress on the brain and body



Stress and aging

Editorial

Marie-France Marin, Ph.D.

Sonia Lupien, Ph.D., Director of the Centre for Studies on Human Stress

Hello dear readers of the Mammoth Magazine! The last few months have been stressful for many of us. However, we must admit that older adults have been particularly affected by the health measures. Could this stressful period have affected their physical and mental health? Given the vast literature on stress and aging, it is reasonable to ask ourselves this question.

In this 24th issue of the Mammoth Magazine, we have decided to address stress in seniors. There are many myths dictating that older adults do not get stressed, that memory loss is normal as we age, and that we cannot do anything about it. Well, you will be happy to know that aging does not always rhyme with pathology. We have worked to put together a series of articles that look at the reality of seniors and the factors that can help or hinder optimal aging.

First, Marie Payer, doctoral student in psychology at the University of Quebec in Montreal (UQAM), spoke with Dr. Louis Bherer, a Quebec researcher known worldwide for his work on the effects of cognitive and physical exercise on the cognitive health of seniors. Next, Raphaël Lapointe and Alexe Bilodeau-Houle, both doctoral students in psychology at UQAM, teach us about the large

categories of cognitive functions and explain how some of these functions are more affected than others during normal aging. In an additional article, Marie Payer writes about negative stereotyping of older adults and the effect that this stress can have on them. You will see that it is important to question our attitudes and beliefs in order to avoid the perpetuation of negative stereotypes that can be harmful to seniors on various levels. Then, Philippe Kerr, doctoral student in biomedical sciences at the University of Montreal, and Robert-Paul Juster, professor in the department of psychiatry and addiction at the same university, co-signed an article on allostatic load and accelerated aging. The physiological changes associated with chronic stress and the cognitive and mental health implications will be discussed. Subsequently, Anne-Marie Kik, a bachelor's student in psychology at the University of Montreal, Silke Jacmin-Park, doctoral student in the same department, and Dr. Robert-Paul Juster, wrote an interesting article on crisis competence in the elderly of the LGBTQ+ community. This concept is based on the fact that some people who experienced discrimination earlier in life may have developed skills to deal with other types of crises later on. This suggests that some older adults may have experienced the pandemic differently given their previous experiences.

Finally, Charlotte Longpré, doctoral student in psychology at the University of Montreal, and Dr. Sonia Lupien, director of the Centre for Studies on Human Stress, wrote the last article in this issue that features a short guide to help seniors manage their daily stress. After all, if there are effects of stress on cognitive performance and health in seniors, the good news is that being well

equipped to deal with stress allows us to be proactive and to potentially diminish the deleterious effects. This in itself is very good news.

We hope that the diversity of the articles in this 24th issue will be to your liking and keep you interested. Happy reading! 📖

Maximizing healthy aging and reducing the onset of disease through physical and cognitive training: is this possible? Profile of researcher Louis Bherer

Marie Payer, *Doctoral student in psychology, University of Quebec in Montreal*

There are numerous physiological and psychological changes that can occur as we age. That is why we asked Dr. Louis Bherer, tenured professor in the department of medicine at the University of Montreal and researcher at the Montreal Heart Institute.

Dr. Bherer began his university career in psychology. During a first research internship, Dr. Bherer spoke with seniors without health problems and found that many of them had questions about aging. They also reported cognitive complaints that were not observed by specialists. At that moment, Dr. Bherer identified the lack of research and sharing of knowledge about normal aging, which was therefore contributing to anticipation and anxiety among certain individuals. At the time, the vast majority of research laboratories in Quebec were conducting studies on pathological aging (i.e., the development of dementia and other disorders that affect functioning). In addition, the media talked about dementia, without mentioning normal aging, thus leading to the belief that aging goes hand in hand with disease. Therefore, the elderly undergoing normal aging lacked the necessary

information to understand the changes they were experiencing. It was at this moment that Dr. Bherer decided to pursue studies in the field of normal aging with the objective of demystifying the various changes related to age, as well as the adaptation processes that are sometimes necessary to maintain healthy functioning.

It is possible to improve as you age!

Throughout his doctoral and postdoctoral studies, Dr. Bherer evaluated the cognitive enhancement abilities in seniors using cognitive training. Cognitive training involves the repeated practicing of a task that requires specific cognitive abilities. One of his first studies was to determine the effects of dual-task cognitive training on attentional abilities in older adults without health problems and young adults. Unexpected results were obtained, namely that dual-task cognitive training allowed young adults as well as seniors to improve their attentional abilities. These results went against the popular belief that aging was associated with an inevitable decline. With his studies, Dr. Bherer arrives at the following conclusion: "Not only does our brain change throughout our life, but it can change in a positive way if we adopt good

With his studies, Dr. Bherer arrives at the following conclusion: "Not only does our brain change throughout our life, but it can change in a positive way if we adopt good lifestyle habits".



Dr. Louis Bherer

lifestyle habits". With this, he began setting up projects involving physical exercise. Today, we know that good physical health, including regular physical exercise, promotes good cognitive health. However, in 2001, this was such a ground-breaking hypothesis that Dr. Bherer was unable to obtain the funding necessary to continue his research on the subject. Dr. Bherer indicates that at the time, the brain was still seen as being disconnected from the rest of the body; the influence of nutrition, lifestyle habits, and physical activity on the brain was seen as a very abstract idea. Fortunately, other research laboratories supported this hypothesis, allowing Dr. Bherer to pursue his own research.

All of these experiments have led Dr. Bherer to found his own research lab that studies the cognitive health of older adults, all while keeping a positive outlook on aging. "I want getting old to be fun", he says. The objective of his laboratory is to change our perception of aging from being seen as a fatal stage of life to a developmental life stage. More specifically, he hopes that his studies will help him delay the onset of disease and promote healthy living through activities and habits that support optimal brain functioning.

How and who can improve as they age?

The first studies in Dr. Bherer's laboratory have shown that regardless of health status or age, physical exercise promotes improved cognitive abilities. In fact, a group of frail seniors (characterized by muscular weakness, slow walking speed, significant fatigue, involuntary weight loss, among others) reported as many benefits on their cognitive health following physical exercise as a group of seniors with no health problems. However, as the frail seniors group had functional limitations, they did not do the same type of exercise (e.g., stationary bike instead of running). At this moment, Dr. Bherer and his colleagues realized that it was necessary to study different types of physical exercise, as the benefits did not seem to be limited to any one type of activity. Dr. Bherer's studies involving different types of physical exercise (weight training, general motor skills, and aerobics) did indeed show that regardless of the type of activity performed, improvements in certain cognitive abilities were observed. With these first studies, he concluded that seniors with or without health problems need to move regardless of the type of exercise they are willing and able to perform.

Are there other benefits to physical exercise?

It has been established in the scientific community that stress can promote the development of cognitive problems, including memory problems. Therefore, according to Dr. Bherer, it was relevant to evaluate whether different physical interventions could reduce stress levels in the elderly and thus, aid in the prevention of cognitive disorders. Thanks



Photo credit: Amélie Philibert

to a partnership with *Les Grands Ballets Canadiens*, Dr. Bherer broadened the type of physical exercise studied by evaluating the effects of dance therapy and cardiovascular physical exercise on the cognitive and physical health of older adults. This is the first project in Dr. Bherer's laboratory where the benefits of exercise on stress have been studied. Two exercise groups were formed where the first group did dance therapy and the second did cardiovascular physical activity (stationary bike). After three months of training, only the seniors who

did dance therapy showed a decrease in the stress hormone, cortisol. Seniors doing cardiovascular physical exercise did not show this decrease. This suggests that different types of physical exercise can have different effects on the body. Dance therapy may have additional effects through its calming and reassuring properties. These results prompted Dr. Bherer to ask an important question: "Cardiovascular exercise and weight training are important, but shouldn't we also do more calming and artistic activities to optimize our health?". To address this

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Photo credit: Amélie Philibert



question, Dr. Bherer is currently conducting a research project in partnership with The Museum of Fine Arts to evaluate the effect of art exposure on cognitive abilities and stress levels in seniors. In addition, he recently collaborated with the provincial parks of the SÉPAQ to identify the various studies that have demonstrated the benefits of nature on mental, physical, and cognitive health. He hopes that these projects will allow specialists to propose a more interesting variety of physical and social activities in order to not only improve cognitive and physical abilities, but also decrease stress levels in seniors.

What are the challenges when studying aging?

In order to gain a better understanding of how the body ages, Dr. Bherer has studied the aging continuum. Some of his studies have been conducted in seniors with a significant health condition (dementia and heart failure), others with seniors without health problems, and some have even been conducted in seniors experiencing super aging (for example, a senior who is considered a top athlete). Dr. Bherer concludes that no matter what type of aging an individual is experiencing, certain cognitive abilities will be preserved, but time will take its toll and difficulties will be perceived. This is why some people, according to Dr. Bherer, will see aging as a bonus and an opportunity to renew themselves, but others will experience a great deal of anxiety and will feel the need to manage their losses. According to Dr. Bherer, by evolving in a society

focused on productivity, we are participating in the isolation of seniors, by not valuing these changes related to aging and the adaptations that are sometimes necessary.

Future studies in Dr. Bherer's laboratory

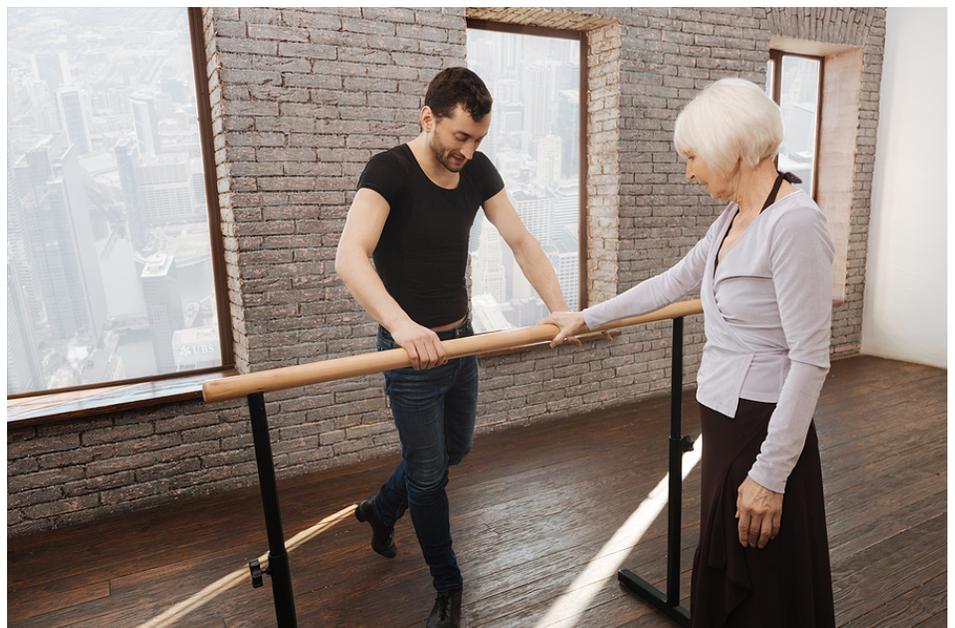
Over the next few years, Dr. Bherer hopes to use these studies to prescribe healthy aging. To do so, he already has plans to introduce new calming activities (e.g., yoga and nature) that he hopes to combine with physical and cognitive training. The range of activities being

studied in his laboratory will continue to grow and allow for the accommodation of any senior according to their needs and motivation. In addition, a more individualized approach that seeks to understand what factors influence one's ability to improve will allow for the more personalized prescription of healthy aging. At retirement, he would like to see seniors being told what activities they need to do to meet their needs, at what level of intensity, and what they should expect as a result, instead of simply being told to go to the gym.

The impact on society

According to Dr. Bherer, the aging of the population represents a major challenge for society. To address this challenge, retirement homes are being built, among others, but Dr. Bherer deplors the fact that the way to approach aging and promoting healthy aging has not been revised. The objective of the studies conducted by Dr. Bherer's laboratory is to bring people of all ages to see that aging is not a disease and that we will never have a magic pill to get rid of the aging process. On the contrary, according to Dr. Bherer, health-promoting lifestyles should be addressed from an early age so that they can be learned over several years. Currently, aging and health-promoting lifestyles are only discussed with

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vulnerable seniors (e.g., following a heart attack). Using the facts highlighted by Dr. Bherer, more prevention efforts can be done by educating youth about health-promoting lifestyles. Although the elderly remains the target of the laboratory's studies, Dr. Bherer hopes that the knowledge acquired will reach everyone and allow for a better integration of aging into society. "A better understanding of aging, its challenges, and adaptations can contribute to the happiness of the elderly and facilitate their adjustments to change", he says. Through these studies and according to Dr. Bherer, this is the positive contribution that society can have on aging. 🐾



According to Dr. Bherer, by evolving in a society focused on productivity, we are participating in the isolation of seniors, by not valuing these changes related to aging and the adaptations that are sometimes necessary.

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If you want to know more about super seniors, we encourage you to read this [article](#) in La Presse (available in French only).





Does aging always rhyme with decline?

Raphaël Lapointe, *Doctoral student in psychology, University of Quebec in Montreal*

Alexe Bilodeau-Houle, *Doctoral student in psychology, University of Quebec in Montreal*

"Darling, have you seen my glasses?"
 "What is his name again?"
 "I cannot focus like I used to!"

Although anyone can say these things, we often hear them from our parents or grandparents. These complaints may reflect a decline in certain cognitive functions associated with aging. Cognitive functions are the abilities of our brain that allow us to perceive the environment, concentrate, remember, learn, reach our goals, and communicate. Decline in these functions can be associated with neurocognitive disorders (e.g., Alzheimer's disease), but for many, it is perfectly normal! Some people show little or no decline. Given the widespread coverage of neurocognitive disorders in the media, we have dedicated this article to normal cognitive decline and "successful aging".

First, let us take a moment to describe cognitive functions.

There are three types of **attention**: **sustained** attention, which allows us to stay focused for long periods of time (e.g., a long drive), **divided** attention, which allows us to do several tasks simultaneously (e.g., noting down what someone says), and **selective** attention,

which allows us to concentrate on what is relevant all while ignoring distractions (e.g., reading while our children are playing in the next room).

Executive functions can be compared to an orchestra conductor who leads the musicians (the other cognitive functions) to ensure that the musical piece is played properly (ensuring that the goal is achieved). We will discuss three of them, but do know that there are more. **Working memory** allows us to maintain, process, and manipulate mental information. It is thanks to our working memory that we can do mental calculations. **Organizational** and **planning** abilities allow us to establish and foresee what steps need to be taken to complete a task. This is very useful when we have to organize something at the last second (or maybe it is because we did not plan ahead)! **Inhibition**, on the other hand, is often compared to a filter or a brake pedal

that allows us to hold back from doing something or from making a comment.

Memory allows us to store information. There are several forms of memory. **Episodic** memory refers to events that we have experienced, such as memories from a trip. **Semantic** memory refers to knowledge that we have acquired about the world (including vocabulary), such as general culture. **Procedural** memory corresponds to learned movements (e.g., riding a bike).

Processing speed is a more general function that refers to the speed at which we understand and react to information.

Visuo-spatial functions allow us to perceive the angle, rotation, distance, movement, and direction of objects in space. It is useful for orientation in a given space, among other things. The **agnosias** are involved in the ability to

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to perceive and recognize objects through our senses.

The **praxises** allow us to make voluntary movements, build objects, and draw pictures.

Language allows us to express ourselves, understand, write, and read.

You can visit the [website](#) of the Quebec Association for Neuropsychologists (available in French only) to learn about the cognitive functions that we have not covered in this article.

Normal cognitive decline

There is a great deal of variability in cognitive aging trajectories among individuals, but some general tendencies can be observed. Researchers often use two concepts to describe the cognitive changes associated with aging: crystallized and fluid intelligence.

Crystallized intelligence corresponds to skills, knowledge and competencies learned, developed and practiced over a life time. In normal aging, cognitive functions associated with crystallized intelligence remain stable and may even improve. This is particularly true for language-related abilities. Indeed, vocabulary enriches with age. Semantic memory also remains stable in normal cognitive aging. Our general knowledge continues to develop with age. Procedural memory is also resistant to age-related changes and remains stable throughout life. Therefore, with normal cognitive aging, we do not lose the ability to ride a bike.



Fluid intelligence includes skills involving problem resolution and reasoning about new and less familiar information that is independent of what the individual has learned. In normal aging, cognitive functions associated with fluid intelligence tend to decline. This is the case as the information processing speed begins to gradually decline starting in our 30s. This “slowing down” also affects other cognitive functions and therefore, is associated with many cognitive changes. Attention is also affected by aging, especially in situations where the attentional needs are complex. For example, talking on the phone while cooking (divided attention), or trying to focus on a conversation in a noisy room (selective attention), are situations where attentional decline is more likely to be felt. However, there is an only a slight decrease in attention in situations with fewer attentional needs (e.g.,

watching television without any distractions). Episodic memory is sensitive to the effects of age. It declines slightly over the years, but the decline becomes more pronounced around 65 years of age. This decline in the effectiveness of episodic memory often leads to an increase in forgetfulness (e.g., forgetting where we left our keys) and difficulty remembering (e.g., not remembering who told us that our neighbor was moving). Seniors tend to perform less well than younger adults at tasks that involve working memory. Such difficulties are also reported for organizational and planning abilities. Inhibition skills also decline with aging, so it may be more difficult to refrain from or control some of our actions and speech.

Visuo-spatial skills, agnosias, and praxias, include both crystallized and fluid aspects. Visual agnosias (the perception and visual recognition of objects) remains stable over time. However, visuo-spatial skills (locating an object and its orientation in space) as well as constructive praxis (putting together the pieces of a puzzle) decline with age, but these weaknesses are mostly seen in more complex situations or tasks.

Why do cognitive functions decline with age?

As we age, the brain undergoes many physiological changes and it is therefore normal that cognitive functions change with age. There are a variety of physiological changes, but we will discuss



atrophy (i.e., reduction of brain size).

For a long time, researchers thought that brain atrophy was explained by the death of neurons, the principal cells of our nervous systems whose role is to receive and transmit nerve impulses (electrical and chemical information). Although neuronal death occurs with aging, we now know that it is not the main cause of brain atrophy: we only lose about 10% of our neurons as we age. In normal aging, rather, we observe modifications of neuronal structures, without necessarily leading to the death of neurons. These changes impact the **dendrites**, **axons**, and **synapses** of neurons (see image 1) and affect their volume and size.

Several studies report a reduction in the number and length of dendrites, which essentially act as the neuron's antennae: they are in charge of **receiving** messages from other neurons. Studies also report a reduction in the number of axons, which can be thought of as an electrical wire responsible for the electrical **conduction** of the neuron. Around the axons is a substance called the myelin sheath, which is often compared to an insulator that facilitates signal conduction. With age, this sheath degrades, reducing the efficiency of nerve conduction. In addition, changes impacting the dendrites and axons affect and reduce the number of synapses, which is the area between two neurons that allow for the **transmission** of information from one neuron to another.

A number of associations have been established between cerebral atrophy and the change in cognitive functions associated with aging. In addition, cerebral atrophy is greatest in the frontal and temporal regions of our brain (see image 2), and these regions

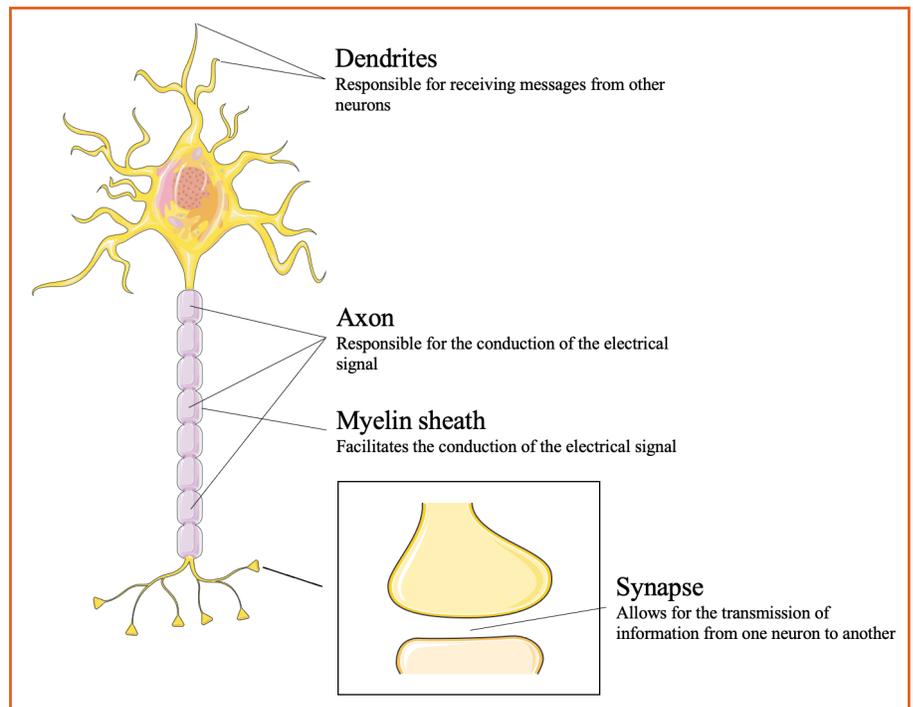


Image 1

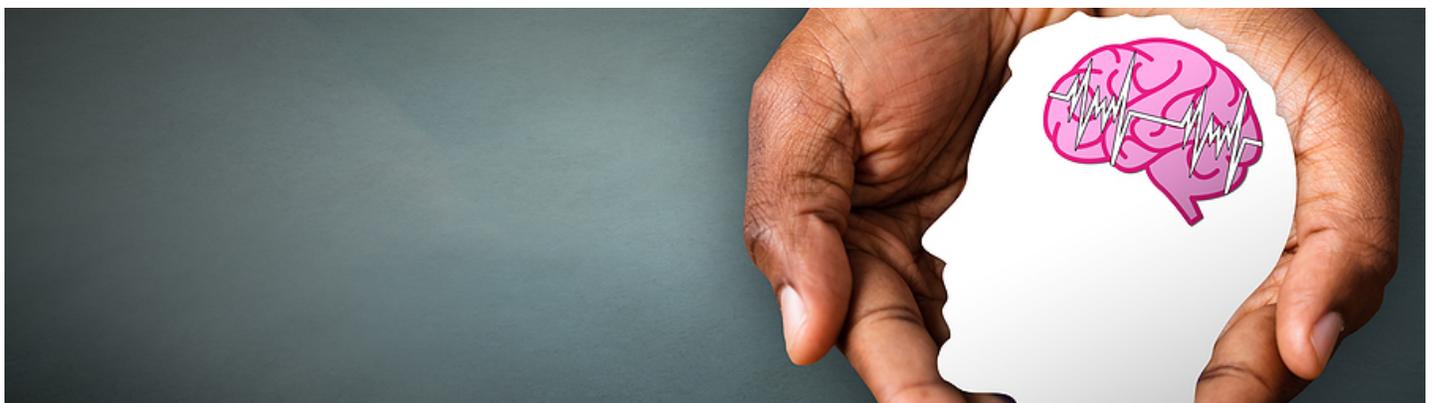
Although neuronal death occurs with aging, we now know that it is not the main cause of brain atrophy: we only lose about 10% of our neurons as we age. In normal aging, rather, we observe modifications of neuronal structures, without necessarily leading to the death of neurons.

are linked to several cognitive functions that decline with normal aging (e.g., attention, executive functions, episodic memory). However, it is important to think critically about these results: the strength of the associations between cerebral atrophy and cognitive decline vary across studies. Also, physiological factors are not the whole story, environmental factors (e.g., physical activity) are also important!

“Successful aging”

As you read in the previous article, aging does not necessarily rhyme with decline: some people will only have a slight

decline in their cognitive functions. This is what we call “successful aging”. The definition of “successful aging” is not unanimous among scientists, but is generally referred to optimal cognitive, physical, and social functioning or the capacity to adapt to age-related changes. Researchers became interested in the factors that promote “successful aging”. They measured changes in cognitive functioning over time and identified three groups of people: those with significant decline, those with normal decline, and those with no decline. Compared to those with normal decline, those without cognitive decline were more likely to have a higher



level of education, be literate, be physically active, and not smoke. Working, volunteering, living with someone, and not having the E4 allele of the ApoE gene (associated with Alzheimer's disease) are other factors associated with "successful aging". Other factors may also be involved, such as social support, having a healthy weight, and the absence of physical illnesses (e.g., hypertension, diabetes). However, keep in mind that the factors associated with "successful aging" can vary across studies. The good news is that many of the factors mentioned above are modifiable! Factors that promote "successful aging" such as being active, not smoking, and being socially active are things that we can do something about.

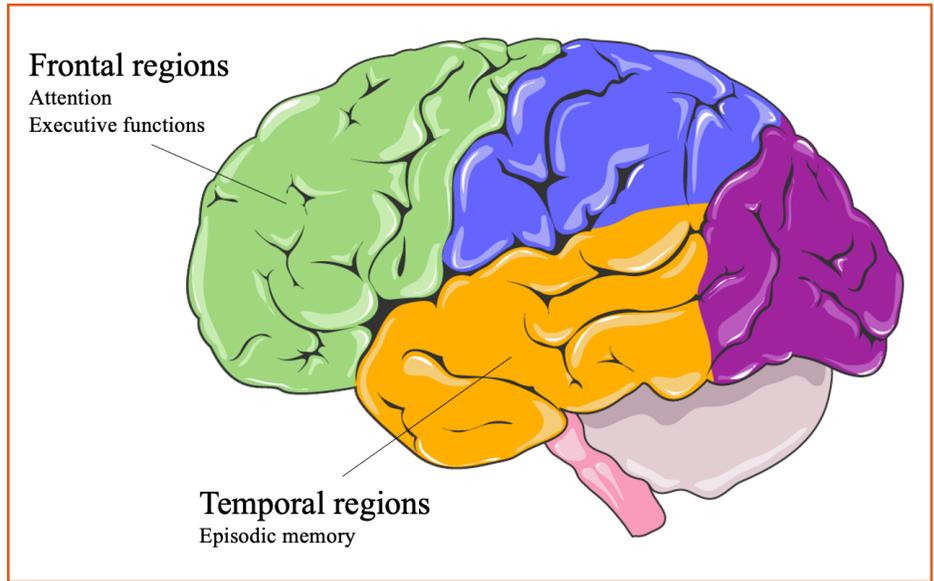


Image 2

The take home message is that cognitive changes associated with aging are normal and are due, in part, to physiological changes in the brain. However, many other factors can influence aging such as environmental factors, many of which are modifiable.

Finally, although researchers define "successful aging" primarily in terms of physical or cognitive health, when seniors are asked to define the term themselves, social engagement and a positive outlook on life are themes that emerge. So, beyond physical and

cognitive factors, the way we see our life is important! 🧠

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What are the effects of age discrimination on the mental and cognitive health of older adults?

Marie Payer, *Doctoral student in psychology, University of Quebec in Montreal*

Age discrimination, also known as ageism, manifests itself in attitudes, behaviours, as well as institutional and political practices directed towards older adults. Therefore, ageism can exist everywhere: in the workplace, in stores, or even at a medical appointment. Ageism can be positive, but it is mostly negative stereotypes that can have harmful effects. Examples of negative age stereotypes include comments such as “Shouldn’t you be retired?”, “You have a good memory for a senior”, or behaviours such as using a childish tone of voice when speaking to a senior. Several studies have attempted to establish the effects of age discrimination on mental health of seniors by measuring stress and depression, among other things. Effects on the cognitive abilities of seniors has also been studied to assess whether our stereotyped attitudes, behaviours, and practices influence their cognitive abilities.

It has been shown that individuals who experience more discrimination also report more mental health problems, psychological distress, and poorer well-being.

Mental health

Age discrimination can be considered a persistent psychosocial stressor. When seniors are faced with a negative stereotype (e.g., “Seniors do not know how to use a cellphone”), pressure accumulates within them for fear of validating the stereotype and being judged or treated negatively. This added pressure can cause stress and affect their performance, making it more difficult for them to succeed than it would be for someone who is not targeted by this stereotype. The persistent presence of stressors in the environment of seniors therefore influences the way they perceive their environment, but also the behaviours they engage in. Not everyone will experience the same degree of ageism as they age. This may vary according to several factors, including family and friends, type of employment, and region. However, it has been shown that individuals who experience more discrimination also

report more mental health problems, psychological distress, and poorer well-being.

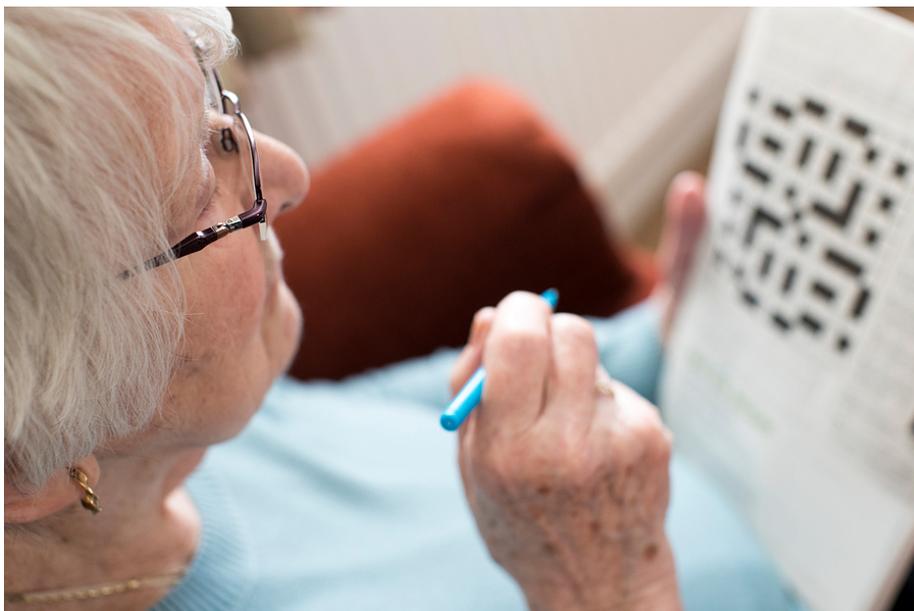
One form of ageism that has been particularly studied is personal endorsement or the internalization of negative stereotypes. Individuals who endorse negatively transmitted ageism report more negative perceptions regarding their aging. For example, they would be more likely to agree with the following statements: “The older I get, the worse it gets” or “We become less useful as we age”. Internalizing negative stereotypes related to age is associated with several consequences, including the development of depressive symptoms and complaints of memory impairment. Unfortunately, ageism can affect the psychological health of seniors.

As ageism acts as a persistent psychosocial stressor, physiological changes may also be associated with ageism. Secretion of stress hormones (notably cortisol in humans) can be affected by age discrimination and stereotypes. A study compared cortisol levels over a period of 30 years in seniors

who internalized negative age stereotypes to seniors who internalized positive stereotypes (e.g., seniors represent wisdom and knowledge). The results showed that only seniors with internalizing negative stereotypes had a 44% increase in cortisol levels over 30 years.

Cognitive abilities

Increased cortisol levels over time can affect the cognitive health of seniors. Cortisol can impair cognitive abilities as it has the capacity to reach the brain. In the laboratory, it has been shown that adopting a childish tone of voice when giving instructions for a cognitive task increases cortisol and decreases cognitive performance in older adults. Another study conducted by the Centre for Studies on Human Stress showed that when seniors are tested in a laboratory study and in an unfavourable environment (unfamiliar location, young evaluators, and instructions that emphasize memory assessment), they secrete more cortisol and perform worse on memory tasks than when they are tested in conditions that favour them (familiar location, older evaluators, and instructions that do not focus on memory abilities). Therefore, this study shows that ageism is unconsciously present in the environment and that it significantly affects the cognitive abilities of seniors. Finally, seniors reporting higher levels of



perceived stress in daily life would also have poorer cognitive performance on memory tasks, information processing speed, and executive functions (including information manipulation in their memory, the ability to inhibit one response to provide another, and the ability to switch from one cognitive task to another).

To conclude, ageism harms the health and well-being of older adults. On the other hand, protective factors for cognitive and psychological health have been identified. First, the quality of the social circle (evidenced through good

social interactions) is a protective factor against negative stereotypes related to age. Quality social interactions can be described as relationships that are non-judgemental, warm, and accessible. Second, the resilience represented by maintaining a positive attitude towards one's own aging is also a protective factor. Although ageism affects psychological and cognitive health, these protective factors confirm that individual and collective actions can be taken to reduce its negative influence on the aging of seniors. *BP*

Another study conducted by the Centre for Studies on Human Stress showed that when seniors are tested in a laboratory study and in an unfavourable environment (unfamiliar location, young evaluators, and instructions that emphasize memory assessment), they secrete more cortisol and perform worse on memory tasks than when they are tested in conditions that favour them (familiar location, older evaluators, and instructions that do not focus on memory abilities).

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Allostatic Load and Accelerated Aging

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Introduction

Stress is an inevitable part of life, but how is it related to aging and how can it affect us throughout the lifespan? This is a very complex question, because the effects of acute stress and eventual chronic stress on the brain and behaviour vary widely according to *when* and *how long* a person is exposed to stress. In addition to accumulation of exposures, individual differences in biological functioning, like genes or hormones, can affect how we cope with chronic stress. In this article, we will introduce and discuss the topics of acute and chronic stress to better explain how stress and aging influence one another.

Fun fact - did you know the word *stress* was initially coined by engineers? In the field of engineering, stress refers to the amount of weight you can apply to a structure before it breaks. That is to say, each building block is necessary and useful to create a solid house, but we must be wary of how we distribute the weight to prevent the house from collapsing. In a sense, human stress is similar. As stress scientists like to say, not all forms of stress are bad as some stress can make materials stronger. Actually, stress is amazing once you

know your way around the house. To understand how stress and aging are related, we must first understand the difference between acute and chronic stress.

Acute and chronic stress in relation to health and disease

As our more experienced readers know, our brains are basically threat detectors. When facing a stressful situation, the brain sends complex signals to the body so it can produce stress hormones, known as cortisol in humans. This biological response is known as *cortisol reactivity* in response to *acute stress*. *Acute stress* is stress that is experienced over a relatively short period of time (usually an event that can be calculated in seconds, minutes, or hours). This form of stress is necessary for bodies to produce stress hormones that help us overcome many daily hassles, whether they be exams or work deadlines. For example, stress can help graduate students meet deadlines to publish articles in the Mammoth Magazine!

Problems usually happen when we experience *chronic* stress – prolonged exposure to stressors that can vary

from weeks to months. Specifically, chronic stress affects our health through a complex biological process that essentially shapes how our brains and bodies respond to stressful situations. This process is known as *allostatic load* - the cumulative effects of chronic stress that can eventually disrupt normal hormonal, immune, cardiovascular, or metabolic functioning. Allostatic load in turn can lead to increased risk of experiencing problems with physical health and mental well-being.

Allostatic load: The wear and tear of chronic stress on the brain and body

Through chronic stress, allostatic load can lead formerly adaptive and healthy biological stress responses to become maladaptive and unhealthy with detrimental long-term effects on our health. In stress research, we can calculate allostatic load by measuring markers of hormonal, immune, cardiovascular, and metabolic functioning in different tissues, such as saliva, blood, and hair. Essentially, this allows us to determine how high one's allostatic load is. Elevated allostatic load is typically indicative of higher disease risk, including many age-related conditions like cardiovascular diseases, depression and cognitive impairments.

Chronological aging, biological aging, and allostatic load

One of the most consistent findings in chronic stress research is that allostatic load increases with age. But why is this the case? In a way, allostatic load can be seen as a measure of accelerated *biological aging*. *Biological aging* is different from *chronological aging* (your actual age). As an example, two people could have purchased a car at the same time last year. However, driver A may have used their car twice as much as driver B since their purchase. As such, both drivers' cars are 1 year old (chronological age), but driver A's car may show earlier signs of wear and tear when compared to driver B's car (biological age). The longer we are exposed to chronic stress, the faster we cause strain on our brains and bodies. As mentioned previously, stress hormones are adaptive and useful in appropriate doses. Unfortunately, prolonged exposure of the brain to stress hormones can lead to changes in brain structures that are usually associated with aging.

Health behaviours and allostatic load

In addition to accumulated or chronic stress as we age, allostatic load is also



Specifically, chronic stress affects our health through a complex biological process that essentially shapes how our brains and bodies respond to stressful situations. This process is known as *allostatic load* - the cumulative effects of chronic stress that can eventually disrupt normal hormonal, immune, cardiovascular, or metabolic functioning.

influenced by our health behaviours. Health behaviours refer to all behaviours and attitudes related to one's own health. This is probably not a surprise to many of our readers, but unhealthy behaviours such as smoking, excessive drinking, drug abuse, poor exercise, bad diets,

and poor sleep habits are also related to increased allostatic load and disease risk. In addition to this, unhealthy behaviours are often how people cope with chronic stress. However, these health behaviours are modifiable. Indeed, health behaviours are interesting targets for future interventions that aim to decrease allostatic load.



Stress hormones are adaptive and useful in appropriate doses. Unfortunately, prolonged exposure of the brain to stress hormones can lead to changes in brain structures that are usually associated with aging.

Intersectionality: how layers of social inequalities can act as chronic stressors

Chronic stress comes in many shapes and colours. That is to say, many forms of chronic stress can influence allostatic load and health differently throughout life. As an example, discrimination related to one's sex and/or race and ethnicity can further compound pre-existing problems and socioeconomic inequalities. Poor socioeconomic status (a measure of educational attainment, financial health, and social standing) is in turn associated with higher levels of allostatic load in midlife.

One very interesting concept that can help us understand this is intersectionality. Intersectionality represents the multiple facets of our society's power structures that can produce and sustain health inequalities. For example, working men and women of diverse age groups are often exposed to age-specific and/or

sex-specific stressors and that can affect allostatic load and health differently. Likewise, one study compared allostatic load in White and Black men and women of various age groups. One very unfortunate finding was that regardless of sex, Black individuals had higher allostatic load levels when compared to White individuals. When you add age to the picture, another study found that Black women aged 40–49 years old and White women aged 50–59 exhibited similar allostatic load levels, suggesting a 10-year ‘weathering effect’ of precarious physiological ‘wear and tear’ among Black women.



Decreasing allostatic load for prevention of age-related diseases

So far, multiple studies have tried to find ways to lower allostatic load to prevent age- and stress-related health outcomes. To this day, however, only a few interventions have been successful, and more research is needed. This may be because we need to fine-tune the way we measure allostatic load to detect more subtle biological changes in relation to age-related diseases.

Conclusion

It is important to acknowledge that stress is an inevitable part of life and that it is not all bad. Instead, the way our bodies respond to *acute stress* can help us overcome the many daily challenges of life. It is when we are exposed to intersecting forms of chronic stress, like sex- and age-specific stressors, and stigma that health problems may emerge.

Many research groups around the world are currently working to find new interventions to lower allostatic load. We expect that some of these interventions will target health behaviours, but also environmental factors like structural stigma, social policies, and childhood abuse to prevent age-related diseases.

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Crisis competence among older LGBTQ+ people

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Older adults who have faced challenges earlier on in life can often show remarkable resilience. We define resilience as a dynamic process that leads to a positive adjustment in the face of adversity (see [Mammoth Magazine Issue 13](#) on resilience). One pathway towards resilience is called crisis competence and will be explored in this article.

The concept of crisis competence

Crisis competence was introduced by Kimmel in 1978 to understand resilience among older **lesbian, gay, bisexual, transgender, and queer** (LGBTQ+) people who often face stigma much earlier on in their lives than many other groups. Studying mainly gay men, Kimmel wrote:

"It is possible that the crisis early in the [LGBTQ+] person's adult life – one that can involve extensive family disruption, intense feelings, and sometimes alienation from the family – may be one of the most significant an [LGBTQ+] person will face. Once resolved, it may provide a perspective on major life

crises and a sense of crisis competence that buffers the person against later crises."

Crisis competence refers to the process whereby marginalized groups can develop resilience in the face of crisis. This is thought to be driven by combinations of risk and resilience factors as individuals develop coping skills, seek social supports, and garner community resources in the face of adversity. Being marginalized can be experienced by women, older adults, race/ethnic minorities, immigrants, disabled people, and many other identities. Combinations of identities or what we call **intersections** can also lead to a compounding of stigma. For example, being an older Black lesbian woman can lead to feeling like being a triple or quadruple minority with potentially 3 to 4 times more lived experiences of ageism, racism, homophobia, and/or sexism. Many people who face synergized stigma face significant health problems. This is an important point, as resilience is not a universal process. For some people,

however, crisis competence teaches us that these experiences can sometimes toughen us up and help us increase psychological skills, improve wellbeing, and even help buffer against crises later in life.

Mastery of crisis

Historically and still today, older LGBTQ+ people face distress and discrimination from societies that often denigrate them. Adjusting to being different forces marginalized people to use coping skills and develop ways to adjust to problems that most adults often only experience when much older in the form of loneliness and alienation. This process can lead to **mastery of crisis** that occurs in two processes. First, **mastery of independence** refers to the lack of family support that older LGBTQ+ people sometimes experience when 'coming out' at an earlier age. To deal with this challenge, many build an independence that enables them to be better prepared emotionally and socially to the complex realities of aging. This is especially important in

finding ways to deal with loneliness and loss when rejected. Second, **mastery of stigma** refers to how LGBTQ+ people can adjust to stigmatization and marginalization to bypass negative impacts. For example, LGBTQ+ people who come out of the closet to their family, friends, and co-workers must do so sometimes at risk of losing relationships and feeling rejected. Like mastery of independence, mastery of stigma enables older LGBTQ+ people to prepare just a little bit better to growing older in a society that is often ageist and alienating. If you think about it, aging adults in general often experience a similar crisis when ageing and when facing alienation for the first time.

Cultivating crisis competence

How can people cultivate crisis competence as they grow older? Regardless of our backgrounds and identities, we all must face important crises in the face of changes in our roles, responsibilities, and relationships. As one grows older, we often must say good-bye to children leaving the home and eventually experience the loss of loved ones. These losses can cause emotional distress and loneliness. On the other hand, role loss and loss in general may be less of a crisis for those who have already felt loneliness or who have lost friends at a younger age than most. Navigating changes in role loss is



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complex but easier by cultivating protective factors that can bolster resilience and promote connectedness to community.

Research focusing on crisis competence among LGBTQ+ seniors have identified factors that promote good psychological adaptation to aging. The most important factor is the self-perception that one's health and wellness is good or excellent. Factors also include low negative attitude towards one's minority identity,

good integration into the larger LGBTQ+ community, strong commitment to one's own identity, low concerns about concealing one's identity from others, and lastly being in a relationship and/or sexually active. At the core of these protective factors among older LGBTQ+ people is a strong sense of self-acceptance, belonging, and meaning when aging. This can be nurtured by anyone.

Probably the most significant factor in cultivating crisis competence is support networks. Support from friends is crucial to building social and emotional support that is sometimes lacking from traditional kinships. Sadly, LGBTQ+ people do not always maintain relationships with families that are not accepting of them. Close friends and the LGBTQ+ community act as a family of choice for many LGBTQ+ people.



Crisis competence during the pandemic

Great loss was sadly faced by many LGBTQ+ people during the HIV/AIDS pandemic that devastated entire communities. At its peak in 1990, AIDS was the cause of death for many gay men aged 24-44 (61% in San Francisco, 35% in New York, 33% in



Boston, and 43% in Miami). Despite all odds, the LGBTQ+ community was able to mobilize and force governments to act for what many politicians simply dismissed as a 'gay plague' that was not affecting the mainstream. The mobilization of the LGBTQ+ community and its allies is a great example of **community crisis competence**. The LGBTQ+ community was able to mobilize to deal with the crisis

of the HIV/AIDS pandemic and to gain civil rights in the process. During the COVID-19 pandemic, research teams are paying close attention to how LGBTQ+ communities and how other groups are coping. As a potential pathway of crisis competence, we recently showed that social support is 4 times stronger for LGBTQ+ Canadians in buffering against distress and depression in the first few

months of the COVID-19 pandemic. We will continue to follow these trends in ongoing research and hopefully provide insights in the near future. 🐾

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A guide to helping an older adult manage their stress

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If we asked you who experiences the most stress out of children, adults, and seniors, what would you say? Adults who have to manage their work, children, friends, their relationships, etc. on a daily basis? This would be a very logical answer, but it is not what the science of stress suggests.

Although adults experience stress, children and seniors are more vulnerable to the effects of stress hormones than adults. We have already covered stress in children in previous issues of this magazine (5, 7, and 18) but there has been little focus on seniors who face many stressors during the aging process. The current article is intended to be a short guide to be used when helping a senior manage their stress. First, we will present the signs and clues to recognize a stress response in a senior. Then, you will find the results of a focus group conducted by our laboratory on the most frequent stressors reported by seniors. Finally, we will suggest some tips and tricks to help them cope with stress. Whether you are a health professional, the loved

one of an older adult, or an older adult yourself, you are sure to find some answers to your questions in this article.

Aging involves numerous social, physiological, and psychological changes. These changes can be sources of stress as they require a certain amount of adaptation, both for the person experiencing them and for those around them. For example, think of a person who has to leave their home and move to a retirement home due to significant memory problems. This change leads to the loss of autonomy for the person and may result in changes to their social circle. This situation can be stressful for the senior and those in their entourage. But to keep it at a minimum, the people close to the senior must adapt their attitude and behaviours to reduce the stress response of the senior.

Regardless of an individual's age, the stress response is universal and the body produces a stress hormone called cortisol. Cortisol has the ability to access the brain and reach the

amygdala and hippocampus, areas responsible for emotions and memory. As the brain of a senior ages, it becomes more sensitive to the effects of cortisol. For example, when a senior is stressed, they may be more confused, have difficulty remembering certain things, are constantly apologizing, or be more emotional. With regards to physical signs, we may observe shaky, cold, or clammy hands, and that the mouth is drier than usual. These are not the only signs that can be recognized in a senior that is stressed, but they are indeed characteristic of this age group.

An excellent starting point is acknowledging that a senior around us is stressed. However, in order to be able to support the person in dealing with this stress, we must first understand the origin of the stress. The science of stress has shown that for a situation to generate a biological stress response, it needs to have one or more of the following characteristics: the person must feel that the situation is **N**ovel **U**npredictable, that it **T**hreatens their

ego (personality), and that they have a Sense of low control over the situation. We use the acronym NUTS to remember these four characteristics. When we understand the characteristics of stress, we have a better understanding of what may be stressful for a senior.

The stress surrounding medical appointments

Many seniors report being very stressed about going to medical appointments, which makes sense as they often have no control over the situation which can be unpredictable given several factors (contacting the clinic, road conditions when traveling, etc.). In 2012, the Centre for Studies on Human Stress conducted a focus group with seniors, health professionals, and researchers to identify the most common sources of stress in seniors, particularly related to medical appointments. Our team surveyed 86 seniors by asking them questions about stressors related to medical appointments or examinations. Results from the focus group showed that there are six main stressors surrounding medical appointment for older adults: the period *before* the appointment, the transportation, the appointment itself, the medical environment, the healthcare professionals, and the examinations and diagnoses. Participants reported experiencing stress when making the

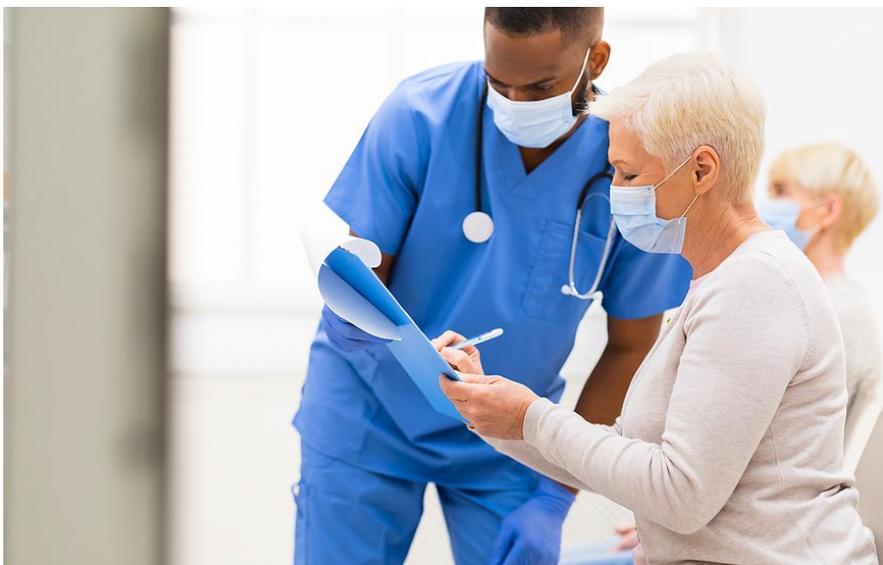
Results from the focus group showed that there are six main stressors surrounding medical appointment for seniors: the period *before* the appointment, transportation, the appointment itself, the medical environment, the healthcare professional, as well as examinations and diagnoses.



For example, when a senior is stressed, they may be more confused, have difficulty remembering certain things, are constantly apologizing, or be more emotional. With regards to physical signs, we may observe shaky, cold, or clammy hands, and that the mouth is drier than usual. These are not the only signs that can be recognized in a senior that is stressed, but they are indeed characteristics of this age group.

appointment (*Is there a long waiting list?*), or finding a professional, and then getting to the appointment (*Will there be parking? Where is the closest metro station?*). Also, participants preferred to be accompanied by someone to their medical appointments,

as it is easier for transportation. In addition, winter is a stressful time of year for seniors due to the higher risk of falling down and the difficulty of driving in winter conditions. The medical environment is also an important element to consider. There can be a lot of people in the waiting room and this can be stressful for seniors in that they do not know when it will be their turn. Healthcare professionals also play a role in stress management for seniors during an appointment. Participants in the focus group reported being stressed by the minimal amount of time spent with the professional to ask all their questions and by the medical vocabulary that is sometimes difficult to understand. Therefore, it is important to take the time to explain the medical terms in lay language to seniors. Finally, receiving diagnoses and undergoing examinations can also be stressful for seniors. Specifically, memory tests have proven to be a major source of stress. Remember that when we are stressed, our memory tends to not be as good. So, it is even more stressful when we are specifically being tested for our memory! In sum, these factors can be



sources of stress for seniors in medical settings, but other more personal factors may also come into play.

Helping a senior manage their stress

From the examples presented above, it is clear that some stressors are specific to older adults. Although these stressors are different from those that a child or adult might experience, it is still possible to identify the NUTS characteristics of stress in the situations described previously. Consider the example of a person who has to go to a medical appointment in winter to undergo cognitive tests for the first time. This situation may involve unpredictability, as it is impossible to know ahead of time what the weather will be like (stormy, road conditions, etc). The situation is novel, as it is the first time that the person will undergo these kinds of tests. The situation can be threatening to the ego as the person's cognitive abilities will be tested. Finally, the person may feel that they have no control over the situation, as they have no idea when they will receive their test results. This example demonstrates the importance of putting yourself in a senior's shoes when they are experiencing stress and to break down the situation according to the four NUTS characteristics. This is essential to gain a better understanding of their reality and to reduce the stressors in their environment. For example, we can try to see how we can reduce the unpredictability aspect of the situation for the senior by offering to drive them to their appointments. We can reduce novelty by helping them visit websites



that describe the kind of tests they will be undergoing, etc.

Super quick ways to stop a stress response

Although the strategy of decomposing a stressful situation into these four characteristics and finding solutions works well, it is not always possible to do so. Consider a person with Alzheimer's disease. This person may not have the resources to reflect on their stress, even with help. In these situations, it is more useful to have super quick ways to naturally reduce stress hormones. For example, we can play them music from their youth or show them objects/items from their generation. Recognizing something from the past can be reassuring and reduce stress. In addition, music has beneficial effects on stress hormones, especially when the tempo is slower.

Also, laughing is always a good strategy to quickly reduce stress hormones. So, if you know what makes the person laugh (jokes, cat videos, etc.), do not hesitate to make them laugh! Finally, several studies have demonstrated the benefits of pets for stress management. In fact, being in the presence of a pet or petting an animal has a calming effect and can reduce stress hormones.

In conclusion, although everyone experiences stress, it is important to focus on the stressors in the lives of older adults as they are more sensitive to them and many changes associated with aging can generate stress responses. Being able to recognize that a senior is experiencing stress and to understand the sources of their stress are key to being able to support them in the future. Take the time to look at the environment and behaviour of a senior in your entourage or workplace. You will certainly discover more factors that are stressful for them. With this guide, you will be able to, hopefully, act to reduce their stress.



RESOURCES & REFERENCES:

[When we test, do we stress? Guide](#)

[Yesteryear Memory Game](#)

[Sonia Lupien's book, Par amour du stress](#)
(available in French only), new revised and updated edition

NEXT ISSUE OF THE MAMMOTH MAGAZINE



DeStress for Success

In the 2000s, studies conducted by the Centre for Studies on Human Stress found that children transitioning from elementary to high school had increased levels of stress hormones. Given that transitions are accompanied by unpredictability and novelty, it is not surprising that this period can be stressful for some children. Based on these findings, the team at the Centre for Studies on Human Stress worked to develop an educational program to teach and equip young people undergoing the transition from elementary to high school about stress, its effects, and ways to manage it. This is how the DeStress for Success© program was born. After validating the program with a group of young people in the greater Montreal area, the Centre for Studies on Human Stress trained a large number of educators and school staff so that they themselves could provide the program in their milieu. In addition, many adaptations of the program have been made so that it corresponds to the different realities of other populations, particularly in youth centres for children with autism. Therefore, the next issue of the Mammoth Magazine will provide an overview of this program, its many adaptations, and the concrete benefits it has had for many young and not so young people!

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