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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

Mental health awareness: understanding, nuancing... and avoiding shortcuts!

Marie-France Marin, Ph.D.
Sonia Lupien, Ph.D., Director of the Centre for Studies on Human Stress

Dear readers,

After a long wait (and we thank you for your patience!), we are delighted to present this new issue of the Mammoth Magazine. An issue that raises an important, perhaps even disturbing question: what if talking about mental health all the time, everywhere, wasn't all good? Over the past few years, the media has taken over the subject of mental health. Reports, podcasts, publications on social media... This content aims to inform, raise awareness and break down taboos. On the surface, this is progress. But a question arises: could this overabundance lead to an over-pathologization of the human experience? Researchers have put forth the prevalence inflation hypothesis: by being constantly exposed to descriptions of disorders, some people may believe they are afflicted at

the slightest discomfort. This phenomenon will be discussed in this issue.

But beware! Mental health awareness has had (and continues to have) profoundly positive effects: it enables thousands of people to come out of the shadows, to put experiences into words, and to seek help. For this reason, there is no question of going backwards. On the contrary, talking about mental health remains essential. But talking about it well is even better.

That's why this issue also invites you to think about the type of content you consume. How can you be sure that what you read, see or hear is reliable? In the age of instant information, everything seems accessible, but is it all accurate? Some content is rigorously prepared, while some oversimplified, taken out of context, or sometimes even wrong. This makes the role of researchers even more crucial: to get out of the laboratory, to express themselves clearly, without sacrificing precision. And the role of all of us, as readers, is to learn to sort, question and look for nuances. It's true that all this may seem demanding, but it's the price of understanding. You'll see in this issue why nuance matters so much: to understand things in their complexity, avoid shortcuts, and move forward together in a more enlightened way.

We begin this issue of the Mammoth Magazine with an interview with Isaac Ahuvia, a doctoral student in psychology at Stony Brook University. The article, co-authored by Félix Duplessis-Marcotte, Audrey-Ann Journault and Alexe Bilodeau-Houle, discusses the prevalence inflation hypothesis, which suggests that awareness efforts for mental health problems can inadvertently inflate their prevalence. Don't worry - we're not saying that mental health problems don't exist. On the contrary! They are real and present in our society. However, it's also important to appreciate that negative emotions are not necessarily a sign of a clinical issue. Isaac Ahuvia's work shows that self-labeling can have negative repercussions, and it's into this issue that we invite you for this first article.

Next, Félix Duplessis-Marcotte, Amélie Gauthier and Audrey-Ann Journault join forces to present three vignettes to illustrate how certain behaviors or emotions can sometimes lead to misdiagnoses, particularly when the interpretation lacks context or nuance. Once again, the aim is not to induce a wave of panic that would make you simply ignore a diagnosis you might have received, but rather to make you aware of the importance of adopting a critical mindset.

The third article, written by Roxane Rousseau, Marie-Charlotte Beaulieu and Alexe Bilodeau-Houle, highlights the importance of considering mental health and mental health disorders as two distinct concepts. Indeed, for a long time, research has medicalized mental health, focusing primarily on diagnoses. In doing so, we mistakenly assumed that the absence of a diagnosis necessarily meant that a person had good mental health. However, as you will see in this article, this is not necessarily the case! Yes, we need to investigate mental health disorders, but we also need to focus on the factors that promote a thriving mental health.

Lisa-Marie Davignon and Alexe Bilodeau-Houle follow with an interesting article on a phenomenon that is increasingly present on social media: cortisol coaches. They raise a number of assertions that are commonly put forward in this context and provide important nuances to help you sort things out.

Then, read an article by Aminata Diop and Sonia Lupien on the distinction between science and pseudoscience. They'll give you some simple and effective tips on how to distinguish scientific information from pseudoscience. It can sometimes seem like a fine line, but with these tips, you'll be able to be more critical in the face of all the information we're constantly exposed to.

For the sixth article, Jessie Provencher and Félix Duplessis-Marcotte summarize the inspiring exchange they had with Mr. Olivier Bernard, Quebec's Pharmachien! Mr. Bernard is an outstanding popularizer of science, dealing with many hot and often controversial topics. He's thus well placed to comment on the beneficial, and sometimes not-so-beneficial, effects of popularizing science. The article also discusses some tips that researchers should try to put into practice when sharing their research results with the public.

Finally, Clémence Peyrot and Amanda Estephan write the last article, providing practical tips on how to spot false information. They also suggest websites that can help you avoid falling into the trap of misinformation.

We sincerely hope you enjoy this issue, and that it serves as a tool to help you better evaluate your future information sources.

Happy reading!

Rethinking how we talk about mental health with Isaac Ahuvia

Félix Duplessis-Marcotte, doctoral student in psychology, Université du Québec à Montréal
Audrey-Ann Journault, Ph.D., postdoctoral fellow, University of Rochester
Alexe Bilodeau-Houle, Ph.D., postdoctoral fellow, Université de Montréal

Over the last few decades, we have made significant prevention efforts to end the stigma surrounding mental health and educate the population so that individuals can identify the symptoms of different mental health problems and seek help. Examples include public figures, such as famous athletes, talking about their mental health problems on television, or educational workshops in schools. While these efforts have helped individuals identify mental health problems earlier, we wondered whether they might have potential drawbacks, given that the prevalence of mental disorders has increased in recent years.

Recently, researchers have proposed the prevalence inflation hypothesis, which suggests that mental health awareness campaigns may unintentionally inflate the prevalence of mental disorders. Increased recognition of symptoms could lead to more diagnosis and treatment, which is beneficial. However, the

"We currently find ourselves in a unique cultural moment where the language of mental health treatment is widely accessible, but actual professional help is not. Even as mental health awareness is increasing worldwide, we haven't spent enough time critically examining its consequences."

Isaac Ahuvia

hypothesis warns of the risk of overdiagnosis, which may result from two key mechanisms. Firstly, using clinical terms to talk about mental health (e.g., calling anxiety a disorder and focusing on its symptoms) can lead individuals to misinterpret normal emotional experiences as pathological. Notably, while anxiety may require intervention, it is not always indicative of a mental health disorder. Secondly, prevention efforts and increased awareness can lead individuals to self-label, i.e. to perceive themselves as suffering from a mental health disorder. This self-perception can then shape their thoughts and behaviors, potentially exacerbating distress and reinforcing belief in a mental health disorder, when they had no actual disorder in the first place.

To delve deeper into the social construction of mental health, we contacted Isaac Ahuvia, an emerging scientist at Stony Brook University, New York. He is currently completing a PhD in clinical psychology, while his undergraduate training was in sociology. As part of his research, Isaac aims to understand how society perceives and influences the conception of mental health disorders, and what the consequences are. Below is a summary of our discussion.

Why is it so important to study the prevalence inflation hypothesis?

"I think the most important thing the prevalence inflation hypothesis has done so far is prompting more people to think critically about how we talk about mental health and illness. Mental illnesses are distinct from physical illnesses in this way;

a virus doesn't care about how you talk about it, nor does a tumor. But the way we understand problems like anxiety and depression can very easily shape our mental and emotional health.

Practically speaking, I am hopeful that this line of research can produce better public health messages around mental health and illness: messages that don't just help people identify mental illness, but also help people understand what to do when they're feeling emotional distress."

What research projects are you currently working on, and what approach are you taking to investigate the prevalence inflation hypothesis?

"We recently published a study on the relationship between depression self-labeling and coping strategies in U.S. college students (published in the *Journal of Affective Disorders*); we found that, when comparing students with similar levels of depression symptoms, students who saw themselves as having depression tended to cope with their emotions in more unhealthy ways. A study on anxiety identity in adults (published in the *Journal of Social and Clinical Psychology*) suggests something similar: adults who see their anxiety as more central to their identity are more likely to avoid things that make them anxious. While avoidance may seem like a sensible strategy to somebody struggling with anxiety, what we know from clinical research is that avoidance tends to make anxiety symptoms worse over time. This speaks to the point above: we're helping people understand what an anxiety disorder is and whether they might have it, but how many people are we educating about the dangers of avoidance?

Neither of these studies shows conclusively that self-labeling causes these negative outcomes, but they do suggest pathways whereby self-labels like depression and anxiety may, for some people, make things worse, not better. In a follow-up study currently underway, we are taking the next step by examining the relationship between depression self-labeling, identity, and coping strategies across time."

How have your discussions of the prevalence inflation hypothesis and self-labeling been received by your peers, students or the media?

"In my experience, people inside and outside of psychology have been very receptive to these ideas.

I think the prevalence inflation hypothesis touches on ideas that feel very intuitive to people, including the notion that the way we talk about mental health is changing, that this could have unintended consequences, and that mental illness labels have the potential to become 'self-fulfilling prophecies.'

Interestingly, people who I speak to about this hypothesis—even people struggling with their own mental health problems—tend to be receptive to its ideas *in general*. The challenge, I think, is when people think you're talking about *them*."

How can we discuss these ideas without invalidating people's emotional experiences?

"It is true that, once somebody sees themselves a certain way (e.g., as somebody who has clinical depression), it can be very invalidating to challenge that identity. I'm also not sure it's necessary to even try; while many of us have seen or heard anecdotes of individuals who seem (to us) to be overinterpreting their problems, research so far does not suggest that this is happening at a wide scale—although much more work is needed on this front.

Luckily, there are a lot of ways we can help people better cope with emotional distress without pushing them to see themselves in one way or another. Instead of trying to convince people that they don't have clinical anxiety, for example, we can teach people that feeling anxiety is perfectly normal, and that even persistent anxiety can pass. Better yet, we can teach people *how* to recover from longer-term bouts of anxiety—what strategies for dealing with anxiety are most beneficial in the long term. For people who have severe and long-lasting anxiety that does not respond to these strategies, we can recommend treatment. Where we get into trouble, I think, is teaching people that they have anxiety (or depression, or anything else), without showing them what to do about it."

Do you think that highlighting this "artificial" inflation in the prevalence of mental health could have its own downsides, such as underestimating genuine mental health problems?

"It is certainly a concern that people will take the wrong lessons from the prevalence inflation hypothesis and related work, perhaps using it to confirm

their prior beliefs that individuals with mental health problems are "faking it" or that mental illness isn't as big of a problem as we think it is.

> **Mental illness absolutely is as big of a problem as we think it is, and in addition to working towards healthier ways of talking about mental health and illness, we need to keep working on ways to improve treatment access for individuals in need."**

What we learned...

Mental health disorders are a major societal problem that deserves attention, funding, prevention and awareness-raising efforts. While the prevalence inflation hypothesis needs further examination, it's crucial to critically examine how our prevention efforts shape the public's understanding of mental health and mental health disorders, especially given the limited availability of professional mental health resources. In our team meetings and with Isaac, we explored solutions that would mitigate the potential drawbacks of mental health prevention and awareness, especially with regard to the risk of inflated prevalence or self-labeling. A good starting point would be for professionals, experts and governments to reframe the messages they disseminate about mental health and mental health disorders. Focusing solely on the identification of psychiatric symptoms leaves too much room for misinformation and fails to inform people about what to do when faced with distress. Offering clear guidance on when mental health problems cross the threshold into disorder (and when they don't) and what to do at different levels of distress could be the key to a more effective response to the mental health crisis.

To learn more about the prevalence inflation hypothesis, we invite you to listen to Sonia Lupien's segment on the subject (available in French only).

When the mental health label is not justified

Félix Duplessis-Marcotte, doctoral student in psychology, Université du Québec à Montréal
Amélie Gauthier, doctoral student in psychoeducation, Université de Montréal
Audrey-Ann Journault, Ph.D., postdoctoral fellow, University of Rochester

How do we know when a behavior or a sensation goes beyond what is normal and is more akin to pathology? According to the Larousse, the word *pathological* is an adjective describing what is due to illness. While the medical field has precise criteria for determining that a set of physical manifestations represents a disease or a deviation from normal development in a person, this same line is much blurrier when it comes to psychological manifestations and mental health. The Diagnostic and Statistical Manual of Mental Disorders (DSM) is a handbook written by a committee of experts to enable mental health professionals to follow certain guidelines in drawing this line. Regardless of the nature of a person's manifestations, two criteria must be met for a diagnosis of mental health disorder, now preferred to the term mental illness. The manifestations must generate significant distress or impair the individual's functioning, and these manifestations must last over time.

Mental health is increasingly discussed in the public sphere. However, since the distinction between normality and pathology is rarely spelled out, many negative emotions and normal human experiences are wrongly labelled as problems for which solutions must be found immediately.

The following three vignettes explore the complexity of the two fundamental criteria required to determine the presence of pathology, as well as the potential harms of misdiagnosis.

THE CASE OF YOUNG PEOPLE SUFFERING FROM ANXIETY

"It's perfect timing!", says anyone who hears that we're conducting a research project on anxiety in young people. But do as many young people have anxiety problems as popular perception would have us believe? Until recently, the only evidence available was that associated with anxiety disorders. According to Statistics Canada, in 2021, 8.4% of Quebecers aged 12 and over were diagnosed with an anxiety disorder by a health professional.

However, in addition to anxiety disorders, anxiety comes in other forms that are not necessarily problematic. Before it becomes a mental health disorder, anxiety is a normal emotion experienced in preparation for an upcoming threatening situation - whether on the agenda or imagined, we are plunged into a state of anxiety. Anxiety is a temporary emotion marked by worry, nervousness and tension. Some people have a greater propensity than others to feel anxious; they have an anxious personality trait. To make the picture even more complex, the situations that trigger anxiety vary from person to person. For example, some young people tend to experience this emotion particularly in response to evaluative situations. This is known as performance anxiety. Others are particularly sensitive to physical sensations (e.g. rapid heartbeat, stomachache) that they perceive as threatening, believing they are going mad or becoming ill. Having any kind of stress response triggers anxiety in these young people; they are highly sensitive to anxiety.

Still, an anxious trait is not a problem, and even brings certain benefits. Even so, the anxiety states experienced more frequently by people with this trait remain uncomfortable. They can eventually cause distress and develop into an anxiety disorder (see criteria above). Yet, all too often, the term "anxiety" is used when we should be talking about "anxiety disorder". It's hardly surprising, then, that the public believes that anxiety is always a problem and worries about any manifestations of anxiety observed in young people.

While science offers exhaustive information for understanding the proportion of young people living with an anxiety disorder, it offers few tools for understanding the so-called normative anxiety that everyone may experience.

To better understand the nature of the triggers of normative anxiety observed in primary and secondary school children, the Centre for Studies on Human Stress launched a research project in 2018. More than 1,400 students from private and public schools answered questionnaires measuring different forms of anxiety (e.g., anxious states, performance anxiety, anxiety sensitivity). A surprising finding from the published results is that the phenomenon of anxiety seems to be less than perceived. Up to 73% of students surveyed reported low-intensity anxiety states and were unlikely to experience this emotion in response to assessments or physical sensations of stress. Furthermore, between 6% and 9% of students were only likely to experience "moderate" anxiety either in assessment situations or when experiencing physical sensations. Finally, 12% of students reported greater anxiety states in response to both triggers, a proportion similar to the prevalence of anxiety disorders presented above.

Making distinctions between the normal and pathological nature of anxiety is therefore essential, so that the voices of young people who really suffer from it are not drowned out by the crowd.

In short, if all young people experienced anxiety, it wouldn't be suffering for everyone.

WHEN ACTIVISM IS PERCEIVED AS A BREAKDOWN IN FUNCTIONING

A growing phenomenon, ecoanxiety is said to be a normal reaction to the threats posed by climate change. Currently, ecoanxiety is not considered a mental health disorder according to the Diagnostic and Statistical Manual of Mental Disorders, but was nevertheless defined by the American Psychological Association in 2017. Despite this, researchers conceive that, like a majority of mental health disorders, ecoanxiety would become pathological when distress and/or impaired functioning are marked in a person. Determining whether a person's functioning is normal or not is a complex and abstract task. This task carries the risk of over-pathologizing ecoanxiety and altering the future behaviors of those affected. By definition, a breakdown in functioning implies, among other things, a range of behaviors altering different spheres of a person's life, including work, lifestyle and interpersonal relationships.

While ecoanxiety can lead to behaviors that significantly transform a person's daily life (e.g., no longer owning a car), the line seems subtle between functional and dysfunctional ecoanxiety - especially when current societal norms are not consistent with significant environmental activism. Indeed, according to the Intergovernmental Panel on Climate Change (IPCC), current human activity is amplifying the climate threat. The latter includes behaviors normalized by the majority while proving detrimental to the planet's viability. Conversely, even if current individual and government initiatives are insufficient, or even problematic, to redress the situation, a willingness to radically change one's lifestyle may be perceived as "abnormal". Some researchers have also attempted to apply a pathological label to environmental activism using various terms, including "climatorexia" or "carborexia" - which closely resemble anorexia. Assessing an activist's functioning can therefore take on a worrying air, although some behaviors are genuinely problematic. For example, it's more accurate to note the pathological aspect of a person who would want to commit suicide to reduce pollution.

Let's take an example of a young adult, named Lou for the purposes of this exercise, who leaves school to become a full-time activist, organizing peaceful demonstrations. His behavior is motivated by his awareness of the urgency of the climate situation - which makes him feel anxious. According to current scientific advances, although his behavior orchestrates significant changes in his life, quitting school is not a pathological behavior. However, by differentiating himself from his peers who are continuing their studies, he may feel out of the norm. One day, while listening to a documentary on generalized anxiety disorder, the young adult recognizes that he has anxiety symptoms (excessive worry that is difficult to control, and that his previous functioning has changed) and tells himself that he must have this disorder. By being exposed to information categorizing his experiences and behavior as problematic, Lou may become more isolated and no longer find meaning in his climatic actions... which will increase his worries and actually impair his functioning.

In short, a better conceptualization of what is normative and non-normative functioning is therefore essential to avoid pathologizing certain behaviors that are substantial for the protection of humanity and living beings.

A COSTLY HYPERACTIVE DIAGNOSIS

In Quebec, there are more students with attention deficit hyperactivity disorder (ADHD) than left-handers. According to the Institut de la statistique du Québec, nearly one in four students is diagnosed with ADHD in secondary schools, suggesting a phenomenon of overdiagnosis. Overdiagnosis occurs when a diagnosis causes more harm than good, even if the diagnosis is correct. This concept is well known in oncology, particularly in breast cancer screening, where women are diagnosed with cancer that would never have affected their quality of life. These cases lead to unnecessary treatment, psychological distress and overburdening of the healthcare system. According to the latest literature reviews on the subject, the overdiagnosis of ADHD is driven by two main mechanisms. Firstly, the criteria established by the DSM are broadened with each new edition. For example, in the latest edition, the minimum age of onset of symptoms has been raised from seven to twelve, increasing the population eligible for diagnosis by 65%.

Secondly, the increased prevalence of ADHD could be caused by a pathologization of normal behaviors. Considered individually, ADHD symptoms are present in all humans (e.g., losing one's keys, procrastinating) and do not represent a problem if they do not significantly impair the person's functioning. On the other hand, Western performance standards may amplify this pathologization of normal behaviors. Studies show that children in highly performance-oriented school environments are 32% more likely to be diagnosed with ADHD than those in non-performance-oriented environments. Similarly, in Quebec, the youngest children in their class are 35% more likely to be diagnosed with ADHD than the oldest, suggesting that behaviors associated with normal age-related immaturity are being pathologized.

Overdiagnosis is not without consequences. On an individual level, it can lead to a disempowerment of the individual, making them less proactive in finding strategies to negotiate attention problems. Overdiagnosis can lead the individual into a self-fulfilling prophecy, where the (supposed) biological cause of their behaviors convinces them that they will be unable to change, leading them to adopt all the more behaviors associated with ADHD. Moreover, medication is accompanied by adverse cardiovascular, nervous, gastric and hormonal effects. For society, overdiagnosis can lead to excessive use of the already saturated healthcare system. In 2018, overdiagnosis of ADHD in young Quebecers cost $17 million for medical services and $41 million for drugs.

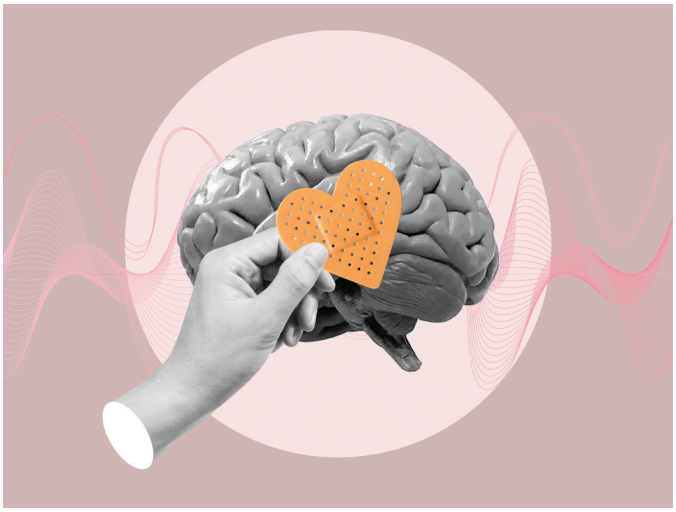
To reduce overdiagnosis, experts recommend a "*watch-and-wait*" approach, similar to that used for other overdiagnosed conditions such as breast cancer. Given that the prefrontal cortex, involved in ADHD, continues to develop into the late 20s, it would be prudent to monitor ADHD symptoms in children without making a diagnosis. Less than 50% of children diagnosed in childhood meet the criteria for ADHD in adulthood. Thus, this approach could avoid diagnosing normal behavior and minimize harm to individuals and society.

The bottom line...

In short, the democratization of mental health is essential, but the examples presented above testify to a hidden side to this societal advance.

While our daily lives are peppered with a range of behaviors that deviate from the norm, such as losing one's keys, feeling sick to one's stomach before an exam or fearing for the future of the planet, the pressures of our environment can sometimes lead us to identify ailments that aren't really ailments at all – causing harm both to ourselves and to society as a whole.

Are we collectively too quick to apply the label "problem"? By becoming aware of the different forms of anxiety, normalizing inattentive behavior and valuing courageous climatic actions, it's possible to draw a line between pathology and normality. It is by discussing these behaviors with nuance that we can help those who are truly suffering from mental health disorders. Lifting the veil on this reality does not imply curbing the benevolent will to raise public awareness of mental health disorders, but simply seeks to paint a more complete picture to better educate and intervene with tomorrow's society.



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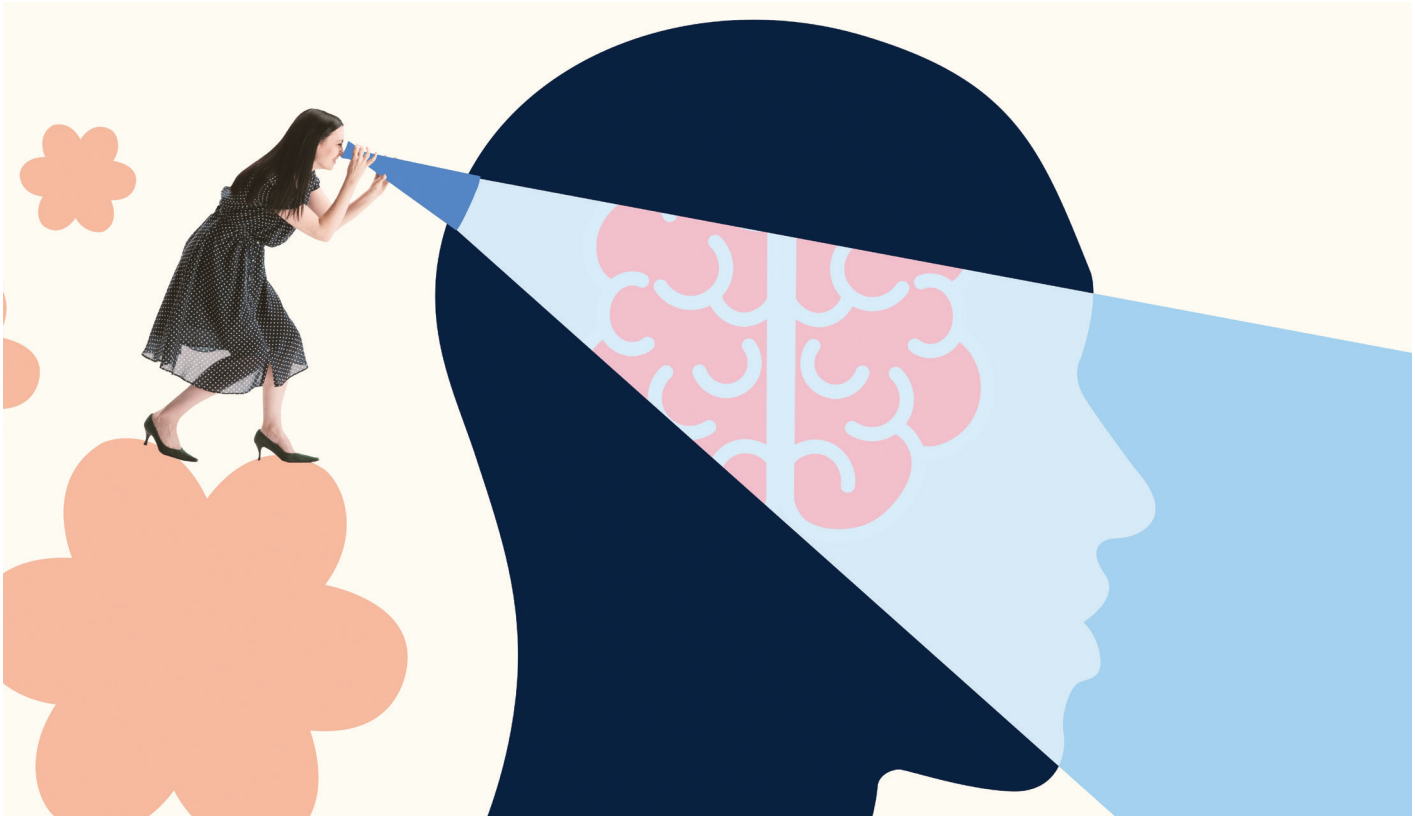
Mental health and mental disorders: two concepts not to be confused

Roxane Rousseau, doctoral student in psychology, Université du Québec à Montréal
Marie-Charlotte Beaulieu, bachelor student in psychology, Université de Montréal
Alexe Bilodeau-Houle, Ph.D., postdoctoral fellow, Université de Montréal



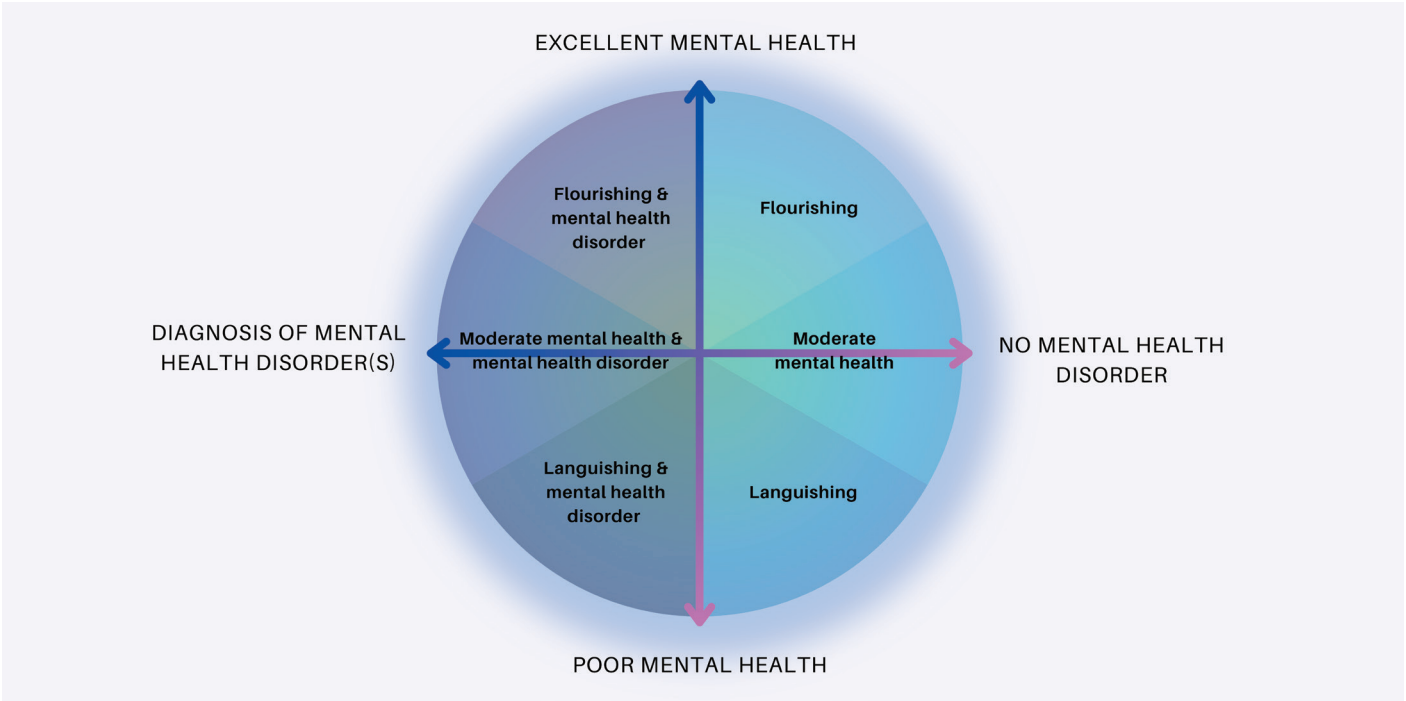
Just use your TikTok search bar or scroll through your Instagram feed to see the popularity of mental health-related themes. Many users offer content to educate and raise awareness among their followers about mental health disorders such as depression or anxiety. This mental health awareness movement is helping to reduce the stigma associated with mental health disorders. In this day and age, collective awareness of mental health issues has greatly increased: we are now more attentive to signs of distress, both our own and those of others, than we were a few decades ago. However, this movement is also accompanied by certain undesirable effects. In particular, there is a growing tendency to diagnose ourselves as having a mental health problem as soon as certain symptoms appear, despite the fact that mood swings are perfectly normal in the face of the ups and downs of everyday life. This raises an important question: do we really understand the distinction between mental health and mental health disorders?

What do we mean by mental health disorders? Mental health disorders are defined by a set of symptoms, a certain number of which must be present with sufficient frequency and severity for a diagnosis to be made. According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), symptoms must cause significant distress or interfere with functioning in important areas of life, such as work, activities of daily living or interpersonal relationships. Take social anxiety disorder, for example. This disorder is characterized by *marked* and *persistent* anxiety (present for six months or more) in one or more social situations where the person fears being judged negatively by others. An essential point in the diagnosis is that the fear must be *out of proportion* to the actual threat. It's perfectly normal to feel anxious in certain social situations, such as public speaking. In this case, most people experience anxiety, but still manage to express themselves publicly. A person with social anxiety disorder will avoid the situation at all costs, and in cases where

avoidance is not an option, they will be overcome by an inordinate anxiety that will greatly affect the quality of their performance. The symptoms of social anxiety disorder lie on a continuum. On one side of the continuum are those extremely affected by social anxiety, on the other, those who experience no social anxiety at all, and in between, a range of people who experience more or less social anxiety. The same applies to all the symptoms associated with mental health disorders.

What about mental health? Does it represent the absence of mental disorders? This was long thought to be the case, but Keyes and colleagues challenged this view in the early 2000s. Through their research, they observed that a low score on a scale measuring depressive symptoms did not necessarily correspond to a high level of psychological well-being. Although psychological well-being tends to increase when depressive symptoms decrease, they are not simple opposites. Thus, these researchers developed the dual continuum model, in which mental health disorders and mental health exist on two distinct continua. As explained above, the various degrees of symptoms associated with mental health disorders lie on a continuum, represented by the horizontal axis in the model (see image). On the vertical axis, we find the fluctuations of mental health. According to this model, mental health is divided into three levels: flourishing, average and languishing. Flourishing mental health is characterized by high levels of emotional well-being (e.g., feeling a general sense of satisfaction), psychological functioning (e.g., having a sense of personal growth) and social functioning (e.g., having a sense of belonging to one's community). In contrast, languishing mental health is characterized by low levels of emotional well-being (e.g., experiencing few positive emotions), psychological functioning (e.g., having a sense of low personal growth) and social functioning (e.g., feeling that one is not contributing to society). Keyes' model distinguishes mental health from mental health disorders. Indeed, poor mental health does not necessarily imply the presence of a mental health disorder. The reverse is also possible: the presence of a mental health disorder does not necessarily mean that a person has poor mental health.

Engaging in discussion about mental health disorders, whether on social media, in the media or elsewhere, helps to reduce stigma and better recognize signs of distress, both in oneself and in others. Nevertheless, it's important to grasp the concept of continuums and understand the nuances between mental health disorders and mental health. We can be at various points on the mental disorder (and mental health) continuum, without actually having a mental health disorder. While self-diagnosis can sometimes



The figure is inspired by Keyes' (2002) dual continuum model of mental health, as presented on the Province of Manitoba's website (Towards Thriving).

help us to better understand our condition, it also entails risks. For example, a person convinced that they have a social anxiety disorder might convince themselves that they are incapable of giving an oral presentation, and avoid the situation, or even refuse a job interview so as not to have to speak in front of a group. This avoidance, while soothing in the short term, only aggravates the anxiety in the long term.

Keyes' observations are crucial in the field of psychology. With regard to the clinical treatment of mental health disorders, Keyes' model suggests that even if we treat the symptoms of a mental health disorder, this does not guarantee that the person will enjoy flourishing mental health. A person may no longer meet the diagnostic criteria for a disorder (e.g., depression), but still have difficulty experiencing happiness or fulfillment in different spheres of their life. So, while the goal of reducing mental health disorders in society is justified and important, according to Keyes, it is also crucial to aim for improved mental health. Obvious, but no less important, recommendations include good social support, physical activity and good sleep hygiene.

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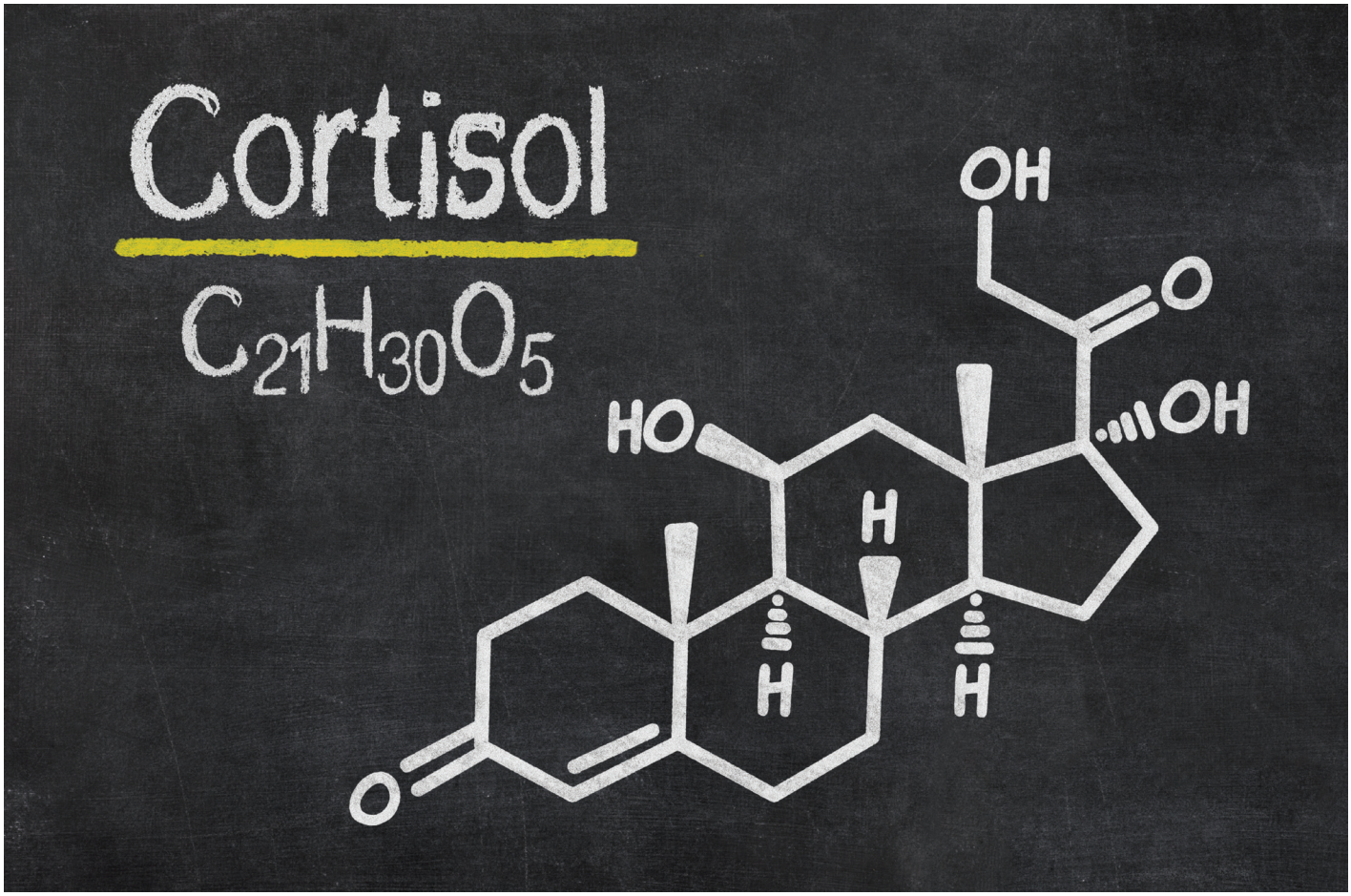
Demystifying the discourse of cortisol coaches on social media

Lisa-Marie Davignon, doctoral student in psychology, Université du Québec à Montréal
Alexe Bilodeau-Houle, Ph.D., postdoctoral fellow, Université de Montréal



Social media like TikTok and Instagram have enabled the emergence of a new category of wellness influencers: *cortisol* coaches. These self-proclaimed experts convey a great deal of information about cortisol, a major stress hormone, which needs to be nuanced. The most damaging of these false beliefs makes cortisol an enemy of health, suggesting that it is desirable to reduce its levels.

To navigate the pseudo-scientific discourse of cortisol coaches, we've searched several of their pages to nuance their content. First of all, we need to know a few basic facts about cortisol. Cortisol is often considered a stress hormone. When we are faced with a stressful situation, the body produces cortisol, which exerts a multitude of effects (e.g., it facilitates access to glucose, the body's main source of energy) enabling us to cope with the situation. Generally, when the stressful situation is over, cortisol levels return to normal. However, cortisol is not only produced in response to stressful situations. In fact, it is secreted every day, according to a circadian rhythm. Specifically, normal cortisol levels are high in the morning, particularly in the first 30-45 minutes after waking up, and then fall throughout the day. In scientific jargon, these cortisol concentrations are often referred to as "diurnal cortisol". In addition to mobilizing the energy needed to overcome every-day challenges, this hormone is responsible for a number of essential physiological functions, such as controlling nutrient utilization and maintaining blood pressure. In short, cortisol is necessary for daily functioning, as well as for responding to stressful situations.

Now, let's take a look at what cortisol coaches say, and nuance some of their statements.

Statement #1: High-intensity, long-duration exercise increases cortisol levels

Nuance: There is a relationship between the intensity and duration of exercise and cortisol levels. According to scientific studies, to induce an increase in cortisol levels in response to endurance physical activity (e.g., running), we need to reach 60% of our maximum oxygen consumption, commonly known as VO2 max. If the physical effort is light, the activity must last longer. For example, at 40% of our VO2 max, training needs to last around 90 minutes for cortisol levels to rise. Strength training (e.g. bodybuilding) can also induce an increase in cortisol levels.

However, this increase in cortisol levels in response to physical activity is quite normal. In fact, it may even be beneficial to training and recovery, so this increase in cortisol is in no way a stress response!

For example, cortisol's effect on tissues helps counteract inflammation and muscle damage. What's more, the increase in cortisol induced by exercise is short-lived: cortisol levels return to normal 120 to 150 minutes after the end of exercise. Moreover, exercise does not appear to alter diurnal cortisol. For example, in the absence of exercise, the cortisol produced over the course of a day (diurnal cortisol) was not increased in people who trained to run, compared with sedentary people. Regular exercise even seems to lead to better adaptation to stressful situations! But beware of overtraining, which can have different effects.

Statement #2: Cortisol causes weight gain

Nuance: Cortisol can indeed be associated with weight gain. In particular, Cushing's syndrome, one of the symptoms of which is weight gain, is caused by hypercortisolism (abnormally high levels of cortisol). Furthermore, as previously mentioned, cortisol levels rise in response to stressful situations and return to normal when the situations are over. However, sometimes stressful situations persist over time and become chronic stressors. These can create a chronic increase in cortisol levels, which is associated with weight gain. Indeed, cortisol can contribute directly to weight gain as it influences the deposition of fat in the body, particularly in the abdominal region. However, cortisol's effect on weight gain is also indirect, since it stimulates appetite. Under stressful conditions, around 70% of people report an increase in food consumption. This increased appetite is directed towards foods rich in sugars and fats. These types of food have addictive potential, in part because of the sense of well-being

and comfort they provide. What's more, the increased intake of rich foods is often accompanied by a poorer lifestyle, since chronic stress factors are associated with a poorer sleep routine and reduced frequency of physical activity. Over time, these concomitant factors contribute to changes in the body that are not directly caused by cortisol levels.

In short, it's mainly abnormally high or very high cortisol levels, linked to illness or the presence of chronic stress factors, that can lead to weight gain. So, reducing cortisol won't make you lose weight. To lose weight, you'll have to change the unhealthy lifestyle habits that are induced by chronic stress.

Statement #3: Putting your face in a bowl of ice water lowers cortisol levels

Nuance: Results from a research laboratory show that immersing the face in a bowl of ice-cold water could prevent a rise in cortisol in response to a stressful situation. Incongruous as it may seem, this effect is due to activation of the vagus nerve, which is closely linked to the facial regions. The vagus nerve is a central component of the parasympathetic nervous system, responsible for calming various bodily functions. However, in the study in question, cortisol levels returned to normal less than one hour later. Moreover, to the best of our knowledge, these results were obtained in a single, small-scale study. Finally, the technique suggested by cortisol coaches refers to the reduction of diurnal cortisol, not cortisol produced in response to a stressful situation. As such, the effectiveness of this technique in reducing diurnal cortisol is not supported by existing research, so we'll have to wait for further studies before making any statements.

As you've probably noticed, the advice given by cortisol coaches is rarely completely wrong. However, they often overlook several crucial nuances, such as the distinction between so-called "diurnal" cortisol and cortisol produced in response to stressful situations. Often, these shortcuts serve to solidify the erroneous view that cortisol is harmful to health, and that it can be reduced through simple actions.

On the basis of this premise, cortisol coaches market various products, such as supplements or personalized consultations aimed at lowering cortisol levels. However, it's important to understand that it's very difficult to raise cortisol levels in people, and equally difficult to lower them. Therefore, no amount of supplements or personalized consultations can stop the human body from producing this hormone that is essential for survival.

Of course, we've only critiqued a few of the statements made by cortisol coaches, but there are many others. The aim of this article was to show that the information disseminated by cortisol coaches is often much more complex, and that we must remain cautious in what we believe. Critical thinking remains the best weapon for assessing the credibility of a

wellness influencer on social media. A lack of nuance in what is said about cortisol, a lack of scientific or health qualifications, and the sale of supplements are just a few red flags that can help navigate the impressive amount of "cortisol" content on social media!

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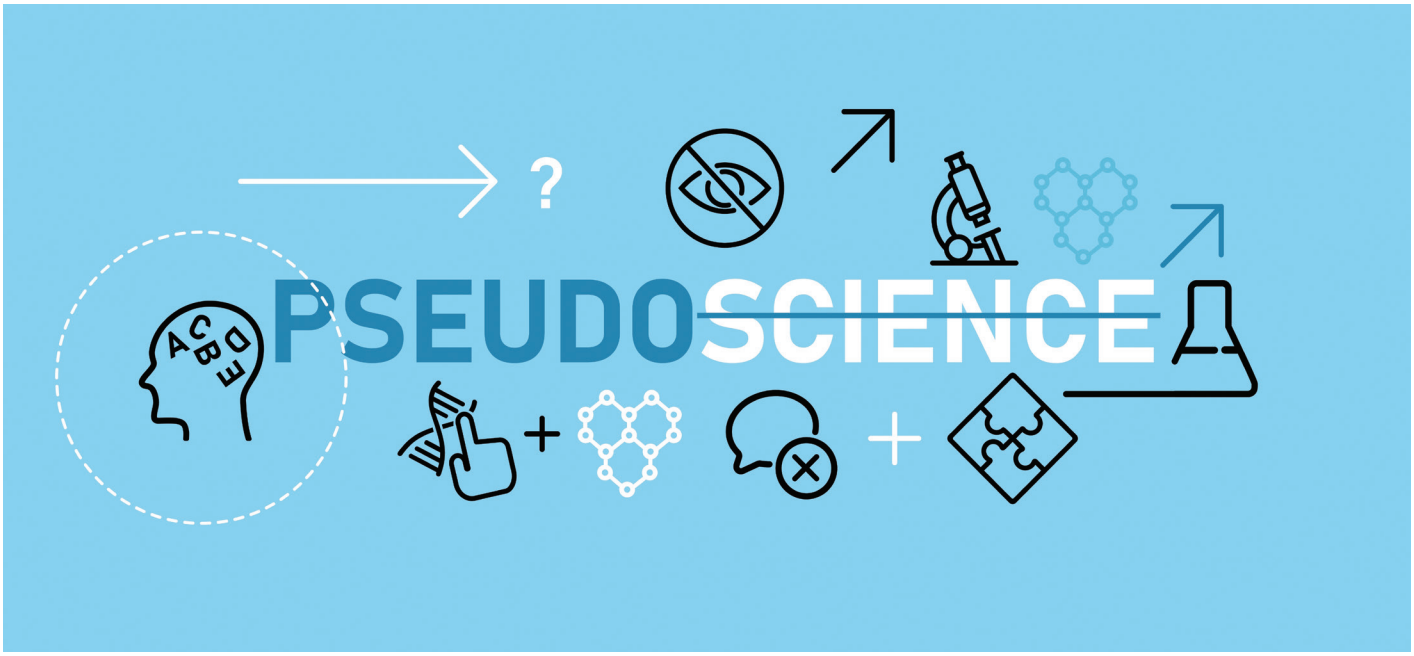
Want to find out more? We invite you to consult this text (available in French only) from the Rumor Detector on the Quebec Chief Scientist's website...

Science or pseudoscience? How to avoid falling in the trap?

Aminata Diop, master's student in psychology, Université de Montréal
Sonia Lupien, Ph.D., Director of the Centre for Studies on Human Stress



In a world of ubiquitous information, it's sometimes difficult to distinguish scientific fact from pseudoscientific claims. The two often seem similar at first glance, but on closer inspection, fundamental differences emerge. At a time when miracle cures and revolutionary theories are flooding social media, it's crucial to know how to identify what is based on rigorous scientific methods, and what is mere speculation or misinformation. To help you tell the difference, here are four key principles for distinguishing scientific facts from pseudo-scientific claims.

1. The principle of refutability

One of the most fundamental characteristics of science is its ability to challenge itself. Karl Popper, a well-known philosopher, proposed the principle of refutability, which has become a pillar of the scientific method.

In other words, for a theory to be considered scientific, it must be capable of being tested and potentially proven false. The process works like this: a hypothesis is first formulated, then tested by rigorous experimentation.

If the results do not confirm the hypothesis, it is rejected. For example, if the hypothesis is that "tall people run faster than short people", an experiment must be carried out to verify this. If the experiment shows that this is not the case, the hypothesis is invalidated (i.e., not confirmed).

In pseudoscience, hypotheses are generally not tested in this way. Instead, people are asked to take their word for granted that the method works, without any supporting evidence. Take the example of uro-therapy, a practice that involves drinking one's own urine in the hope of curing various illnesses such as asthma, migraines or even cancer. No experimental studies have been conducted to prove the efficacy of this method. In science, such a claim would have to be tested by setting up a study where one group of asthmatics is asked to drink their urine, and another group is asked to drink water, and then compare the results over a long period. Several studies with

converging conclusions are also needed if we are to have any confidence in the results.

2. The use of unusual or vague concepts

In science, the concepts used are well-defined and validated by previous research. For example, a neuron is always a neuron, regardless of the scientific theory in which it is mentioned.

In pseudoscience, vague or fabricated terms are often used to give the impression that claims are based on scientific fact.

This phenomenon is known as "neurobabble or neurospeak" - the use of complex, pseudoscientific terms such as "bioelectric neural network" to impress the public, when in fact these terms have no foundations. Take urotherapy again. Advocates of this practice claim that "beneficial substances" present in urine help combat serious illnesses. But what is the nature of these substances? No studies have identified them. This kind of obscure language is typical of pseudoscience, which relies more on the effect of words than on the reality of facts.

3. Resistance to peer review

Science doesn't stop when results are obtained. Each study must be subjected to the rigorous scrutiny of other experts in the field. This process, known as peer review, ensures that the methods used to test the hypothesis are appropriate and that the results are reproducible. In contrast, pseudoscience generally avoids this review process. When pseudoscientific claims are challenged, proponents often respond with personal attacks rather than concrete evidence.

For example, in a debate on the alleged benefits of high doses of vitamin C, advocates of the practice accused their detractors of harming public health, rather than responding with valid studies. This type of response is typical of pseudoscience, which prefers to avoid criticism and external validation.

4. The motivations behind claims

The aim of science is to improve our knowledge and contribute to the well-being of society. Scientific researchers do not pursue personal or commercial objectives. On the other hand, pseudoscience is often motivated by financial gain or notoriety. Practitioners of pseudoscience often seek to sell unproven products or treatments, taking advantage of people's vulnerability.

Once again, the example of urotherapy speaks for itself. Some practitioners sell this method in private clinics, promising miraculous cures, despite the total absence of scientific evidence. The main promoter of urotherapy worldwide, Coen Van der Kroon, is an expert in Greek literature, not a scientist. He now promotes urotherapy worldwide, while selling his consulting services.

Conclusion: Beware of promises too good to be true

So how do you know whether you're dealing with science or pseudoscience? A good indicator is the simplicity of the explanation. Science takes time, progressing in small steps, and its results are often less spectacular than those promised by pseudoscience.

Always ask yourself, "does this sound too good to be true?" If the answer is yes, it probably is. Science is not afraid of nuance, disappointing results or partial discoveries. Pseudoscience, on the other hand, sells the dream, often at the expense of reality. Ultimately, the key to avoid falling into the trap of pseudoscience is to keep a critical mind. If the method they're trying to sell you is so spectacular, why haven't the researchers who discovered it won the Nobel Prize? Why isn't it the talk of the town? Science can be complex and time-consuming, but it's the best tool we have for understanding and improving the world around us.

Hot take! The importance of not getting carried away

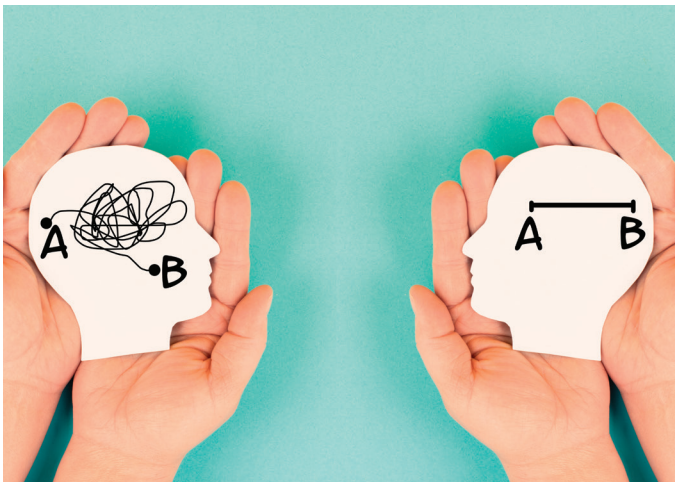
Jessie Provencher, doctoral student in psychology, Université du Québec à Montréal
Félix Duplessis-Marcotte, doctoral student in psychology, Université du Québec à Montréal

We're bombarded with information. Whether it's via traditional media like radio and television, or modern media like social media, the information we receive follows certain fashions. Indeed, certain subjects are said to be "hotter" than others at certain times, which generally creates a craze for information on the part of the population. In recent years, one of the hottest topics has been health, and more specifically mental health. Everywhere we look, we can read and see a number of media campaigns addressing the increase in mental health disorders in the population, the importance of naming these issues and the need to make more services accessible to the population. While these campaigns have positive effects in terms of raising awareness and democratization, we asked ourselves if it's possible that we talk about it too much? To better understand this reality, we spoke to Olivier Bernard, better known by his pseudonym Le Pharmachien, who devotes his career to tackling these hot topics in order to dispel false beliefs and popularize the related scientific facts.

Mr. Bernard, a pharmacist by training, decided to reorient his career after eight years as a practicing pharmacist. He recounts that it was through confronting the false beliefs of his patients that he realized that the public was largely unaware of the misinformation circulating in the media and on social media. As few people were openly addressing this issue at

the time, Mr. Bernard decided to leave his position as a pharmacist to set up several science popularization projects dealing specifically with the hot topics of the day. These last twelve years as a science popularizer have given Mr. Bernard a better understanding of how these subjects influence our society and our beliefs.

We thus asked Mr. Bernard about the consequences of the abundance of information about mental health in the media and on social media. First of all, Mr. Bernard explains that, in his opinion, any topic put forward by the media will have a pendulum effect. For example, the subject of mental health was virtually non-existent in the public discourse for many years. The pendulum swung towards a lack of consideration for mental health, the stigmatization of psychological disorders and under-diagnosis. A few years ago, however, certain mental health issues were raised and democratized in the public arena. As a result, people have begun to talk more about them, to identify with certain symptoms (e.g., those linked to anxiety or attention deficit disorder) and to ask questions about their own mental health. This phenomenon can be a great help to anyone living with significant mental health issues, reducing the stigma surrounding mental health and encouraging the development of public services (balancing act). Conversely, the sudden abundance of information about mental health can lead to an exaggerated perception of the situation within the population, misinformation often conveyed on social media and even self-labeling with a mental health disorder among people who may not have a problem requiring diagnosis. Paradoxically, the democratization of mental health can be detrimental to a person's health, since the mere belief of suffering from a mental health disorder can inadvertently increase the symptoms associated with that same disorder. As a result, people who did not suffer from a mental health disorder in the first place may develop increasingly severe symptoms. This can undermine the accessibility of health services, and lead to a trivialization of the challenges faced by people with significant mental health issues (a pendulum that swings towards an over-generalization of certain problems). According to Mr. Bernard, this back-and-forth effect is normal and necessary when a subject gains popularity in the media in order to return to a state of equilibrium favored by time and science popularization efforts.



Is it possible to prevent these effects, or at least minimize them? On this subject, Mr. Bernard points out that when a theme is gaining ground in society, experts have a duty to consider the cost/benefit ratio associated with increasing its visibility in the population. He adds that it's probably not all research that should be popularized. Sometimes, certain studies are only a small part of the answer to a much larger question. So, while necessary for the advancement of research on a given theme, the information offered by this study is not necessarily representative of the overall picture. As such, it is likely to be more detrimental to public understanding than informative. That said, funding agencies often require that the results of publicly funded studies be made available to the public. This must be done, of course, but in a fair manner, explaining the nuances and clearly identifying the essential points to remember.

It's normal for the public to want to make mental shortcuts when confronted with the complex scientific jargon of researchers, but it's the latter's duty to do everything in their power to avoid this kind of generalization and hasty conclusions in order to inform the public in the best possible way.

Before concluding the interview, Mr. Bernard also wanted to address the belief that more information is always better. This belief has long been, and still very often is, put forward by the media, which often try to convey a great deal of information.

In this respect, Mr. Bernard points out that it is indeed very important for the media to present a diversity of viewpoints in the public arena. However, this diversity must be of high quality, from reliable sources and meet a public need.

In short, we must remember that the role of researchers is to engage in the transfer of knowledge, and to do so in the right way, by putting themselves in the shoes of people who have probably not devoted their lives to studying the same field as they have. We thus have to stop thinking that nuanced ideas are dull and futile. The era of sensationalism has lost popularity, giving way to new trends such as "*long-read*" content and "*slow journalism*", which aim to delve deeper into subjects, presenting nuances and different points of view. As an example, the Pharmachien's podcast "Dérives" on Radio-Canada's podcasting platform, OHdio, covers a single topic in several one-hour episodes, keeping the audience on the edge of their seats throughout.

As readers, we need to stop seeing longer content (articles, podcasts, etc.) as unnecessarily long and tedious, and instead embrace the nuances and debates.

As a researcher and popularizer, Mr. Bernard stresses that it is critical to identify a need in society to attract readers' attention without falling into sensationalism. Science, including that relating to mental health, is far from being all black and white. It's grey, nuanced and evolving, which underlines the importance of presenting it in this light, rather than as unshakeable, absolutely true facts.

Four essential questions to help you spot misinformation

Clémence Peyrot, Ph.D, Clinical research coordinator, Research Centre, Institut universitaire en gériatrie de Montréal
Amanda Estephan, Ph.D, postdoctoral fellow, Université de Montréal

While the Internet and social media are increasingly used as sources of information, we are also seeing more and more false information appearing. False information can be defined in three different ways:

1) **misinformation** is the dissemination of false information with no intention of causing harm;

2) **disinformation** is the provision of false information in order to manipulate or mislead;

3) **malinformation** is the exaggeration or distortion of real facts in order to mislead the public.

Some people therefore disseminate false information, either out of ignorance or intentionally, to influence the reader.

To help you navigate this sea of information and make decisions, inform yourself, debate or form an opinion, whether on an individual or societal scale, we've highlighted a few points to pay attention to.

You can adopt the habit of asking yourself four key questions:

1) What is the source of the information?
2) Who wrote the content?
3) When was the information published?
4) What is the nature of the content?

1. What is the source of the information?

To determine the reliability of a piece of information, it's important to identify its source. Then ask yourself whether the facts reported are transmitted by recognized and credible sources. Here are a few examples of reliable sources:

- Scientific sources such as PubMed, Science et Vie, Sciences et Avenir and National Geographic.
- Government sources such as Santé Québec, Health Canada, Institut national de santé publique du Québec.
- Reliable media: Radio-Canada, Le Devoir, Le Monde, etc.

It's also important to adopt an information triangulation strategy. In other words, can this information be found elsewhere and/or supported by reliable, rigorous references? Reliable information is often quoted in several media or repeated by several experts. In the case of scientific information, it is always relevant to identify whether one or more scientists are cited (researchers, doctors, health professional, etc.) and whether the information reported has been the subject of scientific publications and/or whether scientific references support the assertion. Having identified the source, it is also relevant to look at the author.

2. Who wrote the content?

To find out who the author is, either the person has signed off directly on the content, or the information about the author or media outlet is provided in the "About" or "Contact Us" sections of the website, or in the "profile" section of social media.

Once you have this information, you can determine whether the person is an expert in the field in question, what their qualifications or training are. If no information is provided about the author, you should be cautious, as anonymity can be a sign of an unreliable source.

3. When was the information published?

You should also pay attention to the date of publication. The date of publication or last update of the article, site or document can also be an indicator of the reliability of the content. Knowledge evolves rapidly, especially in certain scientific and technological fields. For example, information published in the 2000s is no longer necessarily true today. It may therefore be a good idea to check whether any recent discoveries or studies have been made in the field in recent years, to get as complete and up-to-date a picture as possible.

4. What is the content of the information?

Finally, when reading the content of the publication, you should keep the following questions in mind:
Is the content simple, short, easy to read, and is "I" used often?

- Are the facts, mechanisms, processes and/or phenomena little or not explained?
- Is the tone assertive and without nuance?
- Does the content evoke a strong emotional response?

If you answer "yes" to any or all of the following questions, it's likely that the information provided is misleading or false. It's then important to check whether you can find similar information on websites from reliable sources.

Content lacking explanations of the mechanisms or processes involved may reveal that the author of the article misunderstands the information and/or tends to simplify, partially report or extrapolate facts without understanding their meaning. This can lead to misinformation.

As for the tone used, a neutral, cautious and objective tone (presenting pros and cons, presenting facts and alternative opinions) is generally more associated with genuine information than an assertive, non-objective tone (an opinion is given). However, in certain situations, a strong opinion can be used (e.g., in a political context). In a scientific context, on the other hand, the article's approach is supposed to be nuanced according to the different scientific evidence available.

Finally, false information is often associated with alarming emotional content that triggers our instinct to detect danger. This alarming character captures our attention, mobilizes our emotions and sometimes encourages us to share the information further.

In conclusion, if a piece of content seems too simple, too categorical or too obvious, caution is called for. Most complex subjects can't be summed up in obvious, simplistic answers.

So keep a critical and vigilant mind as you navigate through this abundance of information. You are now better equipped to detect false information. Let's put that into practice!

Let's take an example from the field of stress to illustrate our point. As mentioned in an article presented earlier in this issue, more and more people are presenting themselves on social media as "cortisol coaches" and claiming to be specialists in understanding the effects of this hormone on metabolism and body weight regulation. So if we go back to our description, we can ask ourselves the following questions:

1) What is the source of the information? Are the facts reported supported by data obtained through scientific research?

2) Who wrote the content? Does this person have an academic background in the medical field or from a credible university? Do they know anything about stress and stress hormones?

3) When was the information published? Are the scientific references recent?

4) What is the nature of the content? Does it explain how and/or why cortisol affects metabolism? Is there any hidden advertising behind the information?

If a general fact is reported without specifying the context and/or is accompanied by hasty conclusions or extrapolations, it's important to conduct more in-depth research by turning toward scientific data. For example, in a publication, the use of an affirmative tone to say that cortisol levels are unbalanced if you gain weight or fail to lose some should lead us to question the subject. If we unpack this statement and look for scientific details, we can ask ourselves the following questions: What level of cortisol are we talking about? Diurnal cortisol (levels fluctuating naturally throughout the day) or reactive cortisol (produced in response to a stressful situation)? Since cortisol levels are not the same from one individual to the next, how can an imbalance be identified? What is a balanced cortisol level? What physiological mechanisms link cortisol to metabolism?

In conclusion, it's essential to consider all the nuances surrounding a statement made on social media, especially when it comes to biological processes that are often far more complex than we're led to believe in this kind of situation.

If you really feel lost between the true and the false, it's always best to turn to the writings of experts who have studied this field in depth.

If you'd like to find out more about the subject of detecting false information, you can find more resources by visiting the following reliable websites:

https://www.sciencepresse.qc.ca/formations (only in French)

https://www.cyber.gc.ca/en/guidance/how-identify-misinformation-disinformation-and-malinformation-itsap00300

https://www.banq.qc.ca/notre-institution/grande-bibliotheque/fausses-nouvelles-les-reperer-et-les-de-jouer/ (only in French)

https://ici.radio-canada.ca/decrypteurs/site?tz=EST (only in French)

https://www.lemonde.fr/les-decodeurs/article/2022/11/18/comment-verifier-les-sources-d-une-information_5067724_4355771.html (only in French)

Let's break the fake | MediSmarts

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