HYPOTHALAMIC NEWSLETTER

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Importance of Fat

Fat has always been commercially associated with unhealthy diets and lack of exercise. What is less commonly known is that fats are not only important but fundamental to our livelihood. In fact, did you know almost 60% of our brains are composed of fat? With that in mind, it should come as no surprise that our brains require fat for proper functioning. Whilst the brain may be a small component of our body weight, it actually utilizes 20 percent of the body's metabolic energy. Besides protective and insulation functions of fat in our body, fat is fuel for our brain as it drives ketosis, providing energy to the brain and helps protect against brain diseases. Here are some types of fats and how they are essential to the brain A diet high in monounsaturated fats also increases production of acetylcholine, a neurotransmitter that plays an important role in learning and memory. In other words, these fat may be advantageous in aiding the process of understanding and retaining information. However since our bodies are unable to produce them, it's important that we incorporate these fat sources in our diets, specifically polyunsaturated and saturated fats. Polyunsaturated fats contain essential fatty acids (EFAs) omega-3 and omega-6, which our brains require to function properly. Omega-3 fatty acids have also

been shown to help brain functions like memory, speaking ability, and motor skills. By increasing the levels of omega-3s conditions such as depression, bipolar disorder, and ADHD have been better. Studies have indicated consumption of these fats have resulted in reduced rates of major depression. As for saturated fat, it is actually one of the main components of brain cells, and is therefore needed for healthy brain. A study found that those who regularly incorporated saturated fats in their diets reduced their risk for developing dementia by 36%. Furthermore, saturated fats provide great benefits for the liver and the immune system and assists in maintaining proper hormone balance in the body. With ever increasing trends of keto diets or intermittent fasting, it is more common than ever to have the misconception that reducing fat intake is always a healthy thing for your body. Rather, consider increasing your consumption of healthy fats by eating steamed fish and drinking milk. You may find yourself feeling more youthful and alert in just a few weeks!

Why forgetting is crucial for the brain to function?

Have you ever misplaced your phone and couldn't remember where you placed it last? Or even tried to reach into the recesses of your mind to remember a name but came up blank? Usually when we think about forgetfulness, it is generally perceived as a negative thing, or even as a cause of worry. This may be because many neurological disorders, such as Alzheimer's, destroy our memory to the point where our identity is lost. Or it might be because memories are what make us us. The experiences we live through and the people we share them with are forever valuable to us humans, whether we know it or not, and not having memories of them can be a pretty scary thought. However, not all types of forgetting are bad or even worrisome. In fact, healthy individuals actually need to be able to forget for their brains to function correctly. So why in the world can't I remember what I ate for dinner last Friday? You may have

caught yourself thinking something along the lines of this. The good thing is that it's perfectly normal and needed. But why? Well, we learn new bits of information every day, so much so that our brain needs to essentially purge the pieces of information we don't need to make room for the new ones. This means that even if you can't remember what you had for dinner last Friday, you can be sure that you'll remember all the information needed for your upcoming math test. In fact, at a recent meeting of the Society for Neuroscience, Wimber, of the University of Birmingham in England, said that "an overly precise memory is maybe not really what we want in the long term, because it prevents us from using our memories to generalize them to new situations". Overall, forgetting is just a way that your brain deals with the huge amount of information it receives everyday. The unneeded information is discarded to make room for the more crucial information needed to make decisions, think clearly, and pass that math test. The connection between forgetting and mental health.

A not-so-known fact about forgetting is that the discarding of unneeded information by the brain is not only essential for functioning properly, but also for our mental health. For example, a key aspect of treatment for many PTSD patients is memory repression. Forgetting the bad thoughts in your head can make for a more peaceful life instead of one governed by unjust actions as a result of these thoughts. All in all, forgetting helps us look to the future instead of the past and gets rid of all that extra noise to make room for the more important information that your brain needs to remember to function and think clearly. The file cabinet of your mind is vast and extremely complex, which makes it crucial to understand how these "files" are stored and why some are deleted from the database completely.

What Makes Something Smell Pleasant?

Have you ever smelled a flower so sweet that it brought a smile to your face? Or have you ever walked past a restaurant that smelled so delectable that it stimulated your appetite? The sensation of smell is one that is quite influential in our daily lives, and can bring many feelings, both pleasant and not so pleasant. But what exactly is it that allows us to smell? How do we process what it is that we are smelling, and why are some things good and others bad? The answer lies in a part of the inferior cerebral hemisphere known as the olfactory bulb. To understand how the olfactory bulb allows animals to assess their environment using scent, it is important to understand its basic anatomy. The olfactory bulb is composed of many olfactory receptor neurons, which serve to receptize molecules from odors. These neurons come together to form olfactory nerves. Humans have 15-20 olfactory nerves located in both sides of the nose. These nerves all have common target cells; the olfactory bulb. Another important part of the olfactory bulb is the neuropil. Neuropil in short are collections of axons, synapses and dendritic branches that exist in between neurons within the gray matter of the brain and spinal cord. Dendrites are cells that receive neuronic impulses from axon cells. Collectively, this neuropil is compounded into a structure known as the glomeruli, which contains mitral cells. Mitral cells are output axons, meaning they will transmit information produced by the glomeruli. With this summary of the anatomy of the human olfactory system, the physiology can now be examined. The detection of a smell begins with the nose. When a specific scent is omitted, the molecules from scent will enter the nose, and trigger the receptors of the olfactory nerves. Each unique scent triggers the receptors which will send a unique message to the glomeruli. Each unique glomeruli response will affect the olfactory bulb in its own way. In fact, each unique activation of the glomeruli is

the key to the differentiation between scents. For example, the smell of a lavender candle will elicit a glomeruli response that is different from a response triggered by the scent of vinegar. Now, what is the cause of some scents being awful and others delightful? One reason is olfactory-receptor memories. The brain is very skilled at creating memories of stimuli that it has experienced in order to learn from them and possibly even provide safety. This ability of the brain can be applied to scents. Imagine two scenarios: in the first one, you have grown up with your mother cooking your favorite dish every weekend; the positive emotions and sensations of this experience will become ingrained in your memory. Now whenever you smell this dish, your brain will release chemicals such as dopamine, causing you to associate the smell as good. In the second scenario, imagine you are a child, and you find a bottle of vinegar. You are curious how it tastes, and are immediately struck by a foul, burning taste. From this point forward, it is likely that your brain will associate vinegar with this unpleasant surprise, and the smell of vinegar will be perceived as bad. Negative and positive smells can also be the result of inherent instinct; it is possible that specific genes are shared by many humans that cause their brains to interpret specific glomeruli responses to be negative. For example, rotten food could have a foul smell due to evolutionary processes. Ancient humans that had a gene causing them to find rotten food to smell foul and therefore avoid eating it had a higher instance of survival than those who would eat rotten food by accident regardless of its smell. And thus, these genes were more frequently passed down, and in present times a majority of the human species carries them. The sense of smell is one that is very significant not only to the enjoyment of pleasant items or memories, but also to survival. The signals transmitted from the neuropils of the glomeruli to the olfactory bulb provide a sense of either pleasure or disgust, leading us to be attracted to an item or driven from it. Our brain's criteria for a good or bad

smell is determined by either factors during our development, or innate genetic traits shared by many members of humanity.

Our Inner Lizard

Have you ever felt your hair stand on end? All of your senses are enhanced. You scan your environment, watching for any potential danger. Suddenly, something comes at you from the bushes! Startled, you scream and run, leaving the bewildered stray cat behind. Although comical at times, your body is equipped with a number of fascinating survival mechanisms. Fear is a crucial element for survival, and is often instant. Your brain is composed of many interconnected systems that allow for this fast, reactionary response. The paraventricular nucleus, or PVN, is largely responsible for the proper execution of physiological stress response. It comprises three functionally distinct areas. One type of neuron projects toward the brainstem and spinal cord, regulating autonomic function. The autonomous nervous system, or ANS, is composed of the parasympathetic nervous system (PNS) and the sympathetic nervous system (SNS). The PNS largely functions as a “rest and digest” system, while the SNS works as a “rest and digest” system, while the SNS works as a “fight or flight” system. When you feel your “blood drain from your face” or your “blood run cold”, this is the body’s conservation of blood to functionally important areas in the case of a stressor, largely from facilitation of the ANS. The second type of functionary neurons in the PVN are the ones regulating the hypothalamic-pituitary-adrenocortical (HPA) axis. In humans, the hypothalamus secretes corticotropin releasing hormone, or CRH, which activates ACTH release in the anterior pituitary. This, in turn, activates the adrenal cortex to release cortisol. Cortisol then enacts a negative feedback loop back to the hypothalamus, telling it to stop secreting more CRH.

Chronic stress can create delays in this feedback loop, potentially resulting in PTSD or other psychiatric disorders due to chronic stress hyperresponsiveness.

The third type of neurons in the PVN are the magnocellular neurons that release neuropeptides. Some common neuropeptides are vasopressin and oxytocin. These peptides are important in regulating physical homeostasis, such as in regards to hydration and immune response. However, they also have some role in other stress responses. For example, both peptides have access to the anterior pituitary, possibly affecting ACTH secretion. CRH neurons also co-secrete peptides. All in all, all systems of the brain and body are closely interconnected, both inhibiting and facilitating each other in reciprocal fashion.

Sources

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