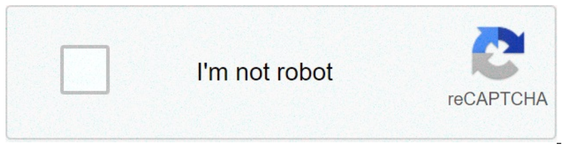

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Dopamine levels in the brain

Share on PinterestYou might've heard that people with ADHD have different levels of brain chemicals, like dopamine and serotonin, than people without ADHD. (No? Just us?) But what does that mean, exactly? And is it possible that bringing your levels closer to the normal range could make it easier to manage your symptoms?To find the answers, we put on our lab coats and investigated the ADHD-dopamine connection. Read on for all the dirty deets about what the relationship might mean for your health and how it affects your daily ADHD symptoms.Let's start by taking a quick look at what dopamine is and its role in your body. Then we'll jump into how it relates to ADHD.Dopamine is a type of chemical messenger — what experts call a neurotransmitter — in your brain. It's involved in a ton of important functions, including regulation of emotional responses. One of the main responses is motivation and reward.Think about any time you've passed on a night out with friends to study for a test — that's your pal dopamine in action. It helps you stay motivated and focused on your goal: getting a good grade so you do well in class.Got it — now what does that have to do with ADHD?ADHD is a complex condition that seems to have many different causes. But research suggests people with ADHD tend to have dopamine action and levels that are different from the norm.Some research has shown that people with ADHD who don't take medication have lower levels of dopamine transporters — proteins that are involved in the release of dopamine. When people with ADHD do take certain medications, their levels of dopamine transporters go up.Another study found that differences in the dopamine transporter gene DAT1 are tied to mood instability but not to other common ADHD traits, like impulsivity or trouble paying attention.Despite this, the relationship between ADHD and dopamine is far from rock-solid. While some studies seem to show a link, others suggest something different.A 2013 study, for instance, concluded that ADHD is more closely related to subtle alterations of gray matter in the brain than to levels of dopamine.Dopamine might not be the only neurotransmitter involved in ADHD. Serotonin is a mood-stabilizing chemical messenger that helps you feel calm, focused, and emotionally stable. Different levels of serotonin might have something to do with ADHD.Does ADHD have a link to serotonin levels?Maybe. A recent research review found that a serotonin deficit could be partially responsible for triggering ADHD symptoms and that people genetically inclined to have altered serotonin activity are more likely to have ADHD.Just as significant? Taking selective serotonin reuptake inhibitors (SSRIs) or l-tryptophan (a precursor to serotonin) appears to alleviate some symptoms. Translation: The participants in this review who received a serotonin boost saw their ADHD symptoms mellow out.If your ADHD is getting in the way of your daily life, altered activity of dopamine or serotonin could have something to do with your symptoms going haywire. It's also possible that treatments to balance those neurotransmitters could help you feel better.How low dopamine or serotonin might impact your daily lifeBoth dopamine and serotonin play key roles in helping you feel calm and focused. So when these neurotransmitters are not acting the way they should, you might feel anxious, have trouble concentrating, or feel less motivated to get things done.ADHD treatment options for low dopamine or serotoninIf you feel like your ADHD symptoms aren't under control, start by talking with your doctor. Together you can figure out whether dopamine or serotonin could be to blame — and whether treatment to balance these neurotransmitters might be helpful. You might benefit from medications such as:StimulantsIt might seem odd to take stimulants for hyperactivity. But stimulant drugs like Adderall and Ritalin work by boosting your brain's levels of neurotransmitters (like dopamine), which could help increase your focus and attention.AntidepressantsMediations like Effexor and Pamelor aren't typically prescribed to treat ADHD symptoms alone. But they can be helpful for people who are taking stimulants for ADHD and who also have depression, since they increase effects of serotonin and epinephrine in your brain.Home remedies for low dopamine or serotoninStimulants tend to be the standard treatment for ADHD. But you can also take other steps to promote healthy dopamine and serotonin.Eating a high protein diet, exercising regularly, and getting enough sleep and sunlight are all science-backed ways to boost your dopamine levels naturally. You can up your serotonin levels, too, by eating more eggs, cheese, nuts, seeds, and salmon. Skip To Content BOSTON, MA — New research on the brain is showing that addiction is a matter of memories, and recovery is a slow process in which the influence of those memories is diminished, reports the January 2007 issue of the Harvard Mental Health Letter.Studies have shown that addictive drugs stimulate a reward circuit in the brain. The circuit provides incentives for action by registering the value of important experiences. Rewarding experiences trigger the release of the brain chemical dopamine, telling the brain "do it again." What makes permanent recovery difficult is drug-induced change that creates lasting memories linking the drug to a pleasurable reward. As a service to our readers, Harvard Health Publishing provides access to our library of archived content. Please note the date of last review or update on all articles. No content on this site, regardless of date, should ever be used as a substitute for direct medical advice from your doctor or other qualified clinician. We include products we think are useful for our readers. If you buy through links on this page, we may earn a small commission. Here's our process. How the human brain worksThe human brain is an intricate organ. At approximately 3 pounds, it contains about 100 billion neurons and 100 trillion connections. Your brain is command central of all you think, feel, and do.Your brain is divided into two halves, or hemispheres. Within each half, particular regions control certain functions.The two sides of your brain look very much alike, but there's a huge difference in how they process information. Despite their contrasting styles, the two halves of your brain don't work independently of each other.Different parts of your brain are connected by nerve fibers. If a brain injury severed the connection between sides, you could still function. But the lack of integration would cause some impairment.The human brain is constantly reorganizing itself. It's adaptable to change, whether it's physical or through life experience. It's tailor-made for learning.As scientists continue mapping the brain, we're gaining more insight into which parts control necessary functions. This information is vital to advancing research into brain diseases and injuries, and how to recover from them.Share on PinterestThe theory is that people are either left-brained or right-brained, meaning that one side of their brain is dominant. If you're mostly analytical and methodical in your thinking, you're said to be left-brained. If you tend to be more creative or artistic, you're thought to be right-brained.This theory is based on the fact that the brain's two hemispheres function differently. This first came to light in the 1960s, thanks to the research of psychobiologist and Nobel Prize winner Roger W. Sperry.The left brain is more verbal, analytical, and orderly than the right brain. It's sometimes called the digital brain. It's better at things like reading, writing, and computations.According to Sperry's dated research, the left brain is also connected to:logicsequencinglinear thinkingmathematicsfactsthinking in wordsThe right brain is more visual and intuitive. It's sometimes referred to as the analog brain. It has a more creative and less organized way of thinking.Sperry's dated research suggests the right brain is also connected to:imaginationholistic thinkingintuitionartsrhythmnonverbal cuesfeelings visualizationdaydreamingWe know the two sides of our brain are different, but does it necessarily follow that we have a dominant brain just as we have a dominant hand?A team of neuroscientists set out to test this premise. After a two-year analysis, they found no proof that this theory is correct. Magnetic resonance imaging of 1,000 people revealed that the human brain doesn't actually favor one side over the other. The networks on one side aren't generally stronger than the networks on the other side.The two hemispheres are tied together by bundles of nerve fibers, creating an information highway. Although the two sides function differently, they work together and complement each other. You don't use only one side of your brain at a time.Whether you're performing a logical or creative function, you're receiving input from both sides of your brain. For example, the left brain is credited with language, but the right brain helps you understand context and tone. The left brain handles mathematical equations, but right brain helps out with comparisons and rough estimates.General personality traits, individual preferences, or learning style don't translate into the notion that you're left-brained or right-brained.Still, it's a fact that the two sides of your brain are different, and certain areas of your brain do have specialties. The exact areas of some functions can vary a bit from person to person.According to the Alzheimer's Association, keeping your brain active may help increase vitality and possibly generate new brain cells. They also suggest that a lack of mental stimulation may increase the risk of developing Alzheimer's disease.Here are a few tips to keep your brain stimulated:In addition to thinking exercises, your brain benefits from a good physical workout. Just 120 minutes of aerobic exercise a week can help improve learning and verbal memory.Avoid junk food and be sure to get all the essential nutrients you need through diet or dietary supplements. And, of course, aim for a full night's sleep every night.If you're trying to nourish your creative side, here are a few ways to get started:Read about and listen to the creative ideas of others. You might discover the seed of an idea you can grow, or set your own imagination free.Try something new. Take up a creative hobby, such as playing an instrument, drawing, or storytelling. A relaxing hobby can help your mind wander to new places.Look within. This can help you gain a deeper understanding of yourself and what makes you tick. Why do you gravitate toward certain activities and not others?Keep it fresh. Break your set patterns and go outside your comfort zone. Take a trip to a place you've never been. Immerse yourself in another culture. Take a course in a subject you haven't studied before.Even something as creative as music takes time, patience, and practice. The more you practice any new activity, the more your brain adapts to the new information.Want to boost your creativity? Give adult coloring books a try.Whether you're working out a complicated algebraic equation or painting an abstract work of art, both sides of your brain are actively participating and providing input.You're not truly left-brained or right-brained, but you can play to your strengths and continue broadening your mental horizons. A normal, healthy brain is capable of lifelong learning and boundless creativity.Read this article in Spanish. Written by Erica Julson, MS, RDN, CLT on May 10, 2018Dopamine is an important chemical messenger in the brain that has many functions.It's involved in reward, motivation, memory, attention and even regulating body movements (1, 2, 3).When dopamine is released in large amounts, it creates feelings of pleasure and reward, which motivates you to repeat a specific behavior (4, 5).In contrast, low levels of dopamine are linked to reduced motivation and decreased enthusiasm for things that would excite most people (6).Dopamine levels are typically well regulated within the nervous system, but there are some things you can do to naturally increase levels.Here are the top 10 ways to increase dopamine levels naturally.Share on PinterestProteins are made up of smaller building blocks called amino acids.There are 23 different amino acids, some of which your body can synthesize and others that you must get from food.One amino acid called tyrosine plays a critical role in the production of dopamine.Enzymes within your body are capable of turning tyrosine into dopamine, so having adequate tyrosine levels is important for dopamine production.Tyrosine can also be made from another amino acid called phenylalanine (7).Both tyrosine and phenylalanine are naturally found in protein-rich foods like turkey, beef, eggs, dairy, soy and legumes (8).Studies show that increasing the amount of tyrosine and phenylalanine in the diet can increase dopamine levels in the brain, which may promote deep thinking and improve memory (7, 9, 10).Conversely, when phenylalanine and tyrosine are eliminated from the diet, dopamine levels can become depleted (11).While these studies show that extremely high or extremely low intakes of these amino acids can impact dopamine levels, it's unknown whether normal variations in protein intake would have much impact.Summary Dopamine is produced from the amino acids tyrosine and phenylalanine, both of which can be obtained from protein-rich foods. Very high intakes of these amino acids may boost dopamine levels.Some animal research has found that saturated fats, such as those found in animal fat, butter, full-fat dairy, palm oil and coconut oil, may disrupt dopamine signaling in the brain when consumed in very large quantities (12, 13, 14).So far, these studies have only been conducted in rats, but the results are intriguing.One study found that rats that consumed 50% of their calories from saturated fat had reduced dopamine signaling in the reward areas of their brain, compared to animals receiving the same amount of calories from unsaturated fat (15).Interestingly, these changes occurred even without differences in weight, body fat, hormones or blood sugar levels.Some researchers hypothesize that diets high in saturated fat may increase inflammation in the body, leading to changes in the dopamine system, but more research is needed (16).Several observational studies have found a link between high saturated fat intake and poor memory and cognitive functioning in humans, but it's unknown whether these effects are related to dopamine levels (17, 18).Summary Animal studies have found that diets high in saturated fat can reduce dopamine signaling in the brain, leading to a blunted reward response. However, it's not clear whether the same is true in humans. More research is needed.In recent years, scientists have discovered that the gut and brain are closely linked (19).In fact, the gut is sometimes called the "second brain," as it contains a large number of nerve cells that produce many neurotransmitter signaling molecules, including dopamine (20, 21).It's now clear that certain species of bacteria that live in your gut are also capable of producing dopamine, which may impact mood and behavior (22, 23).Research in this area is limited. However, several studies show that when consumed in large enough quantities, certain strains of bacteria can reduce symptoms of anxiety and depression in both animals and humans (24, 25, 26).Despite the clear link between mood, probiotics and gut health, it's not yet well understood.It's likely that dopamine production plays a role in how probiotics improve mood, but more research is needed to determine how significant the effect is.Summary Probiotic supplements have been linked to improved mood in humans and animals, but more research is needed to determine the exact role dopamine plays.Velvet beans, also known as Mucuna pruriens, naturally contain high levels of L-dopa, the precursor molecule to dopamine.Studies show that eating these beans may help raise dopamine levels naturally, especially in people with Parkinson's disease, a movement disorder caused by low dopamine levels.One small study in those with Parkinson's disease found that consuming 250 grams of cooked velvet beans significantly raised dopamine levels and reduced Parkinson's symptoms one to two hours after the meal (27).Similarly, several studies on Mucuna pruriens supplements found that they may be even more effective and longer lasting than traditional Parkinson's medications, as well as have fewer side effects (28, 29).Keep in mind that velvet beans are toxic in high amounts. Make sure to follow dosage recommendations on the product label.Even though these foods are natural sources of L-dopa, it's important to consult with your doctor before making changes to your diet or supplement routine.Summary Velvet beans are natural sources of L-dopa, a precursor molecule to dopamine. Studies show that they may be as effective as Parkinson's medications at boosting dopamine levels.Exercise is recommended for boosting endorphin levels and improving mood.Improvements in mood can be seen after as little as 10 minutes of aerobic activity but tend to be highest after at least 20 minutes (30).While these effects are probably not entirely due to changes in dopamine levels, animal research suggests that exercise can boost dopamine levels in the brain.In rats, treadmill running increases the release of dopamine and upregulates the number of dopamine receptors in the reward areas of the brains (31).However, these results have not been consistently replicated in humans.In one study, a 30-minute session of moderate-intensity treadmill running did not produce an increase in dopamine levels in adults (32).However, one three-month study found that performing one hour of yoga six days per week significantly increased dopamine levels (33).Frequent aerobic exercise also benefits people with Parkinson's disease, a condition in which low dopamine levels disrupts the brain's ability to control body movements.Several studies have shown that regular intense exercise several times per week significantly improves motor control in people with Parkinson's, suggesting that there may be a beneficial effect on the dopamine system (34, 35).More research is needed to determine the intensity, type and duration of exercise that is most effective at boosting dopamine in humans, but the current research is very promising.Summary Exercise can improve mood and may boost dopamine levels when performed regularly. More research is needed to determine specific recommendations for increasing dopamine levels.When dopamine is released in the brain, it creates feelings of alertness and wakefulness.Animal studies show that dopamine is released in large amounts in the morning when it's time to wake up and that levels naturally fall in the evening when it's time to go to sleep.However, lack of sleep appears to disrupt these natural rhythms.When people are forced to stay awake through the night, the availability of dopamine receptors in the brain is dramatically reduced by the next morning (36).Since dopamine promotes wakefulness, reducing the sensitivity of the receptors should make it easier to fall asleep, especially after a night of insomnia.However, having less dopamine typically comes with other unpleasant consequences like reduced concentration and poor coordination (37, 38).Getting regular, high-quality sleep may help keep your dopamine levels balanced and help you feel more alert and high-functioning during the day (39).The National Sleep Foundation recommends 7–9 hours of sleep every night for optimal health for adults, along with proper sleep hygiene (40).Sleep hygiene can be improved by sleeping and waking at the same time each day, reducing noise in your bedroom, avoiding caffeine in the evening and only using your bed for sleeping (41).Summary Lack of sleep can reduce dopamine sensitivity in the brain, resulting in excessive feelings of sleepiness. Getting a good night's rest may help regulate your body's natural dopamine rhythms.Listening to music can be a fun way to stimulate dopamine release in the brain.Several brain imaging studies have found that listening to music increases activity in the reward and pleasure areas of the brain, which are rich with dopamine receptors (42, 43).A small study investigating the effects of music on dopamine found a 9% increase in brain dopamine levels when people listened to instrumental songs that gave them chills (44).Since music can boost dopamine levels, listening to music has even been shown to help people with Parkinson's disease improve their fine motor control (45).To date, all studies on music and dopamine have used instrumental tunes so that they can be sure the increases in dopamine are due to the melodic music — not specific lyrics.More research is needed to see if songs with lyrics have the same, or potentially greater, effects.Summary Listening to your favorite instrumental music may boost your dopamine levels. More research is needed to determine the effects of music with lyrics.Meditation is the practice of clearing your mind, focusing inward and letting your thoughts float by without judgment or attachment.It can be done while standing, sitting or even walking, and regular practice is associated with improved mental and physical health (46, 47).New research has found that these benefits may be due to increased dopamine levels in the brain.One study including eight experienced meditation teachers found a 64% increase in dopamine production after meditating for one hour, compared to when resting quietly (48).It's thought that these changes may help meditators maintain a positive mood and stay motivated to remain in the meditative state for a longer period of time (49).However, it's unclear whether these dopamine-boosting effects only happen in experienced meditators, or if they occur in people who are new to meditation as well.Summary Meditation increases dopamine levels in the brains of experienced meditators, but it's unclear whether these effects would also occur in those who are new to meditation.Seasonal affective disorder (SAD) is a condition in which people feel sad or depressed during the winter season when they are not exposed to enough sunlight.It's well known that periods of low sunshine exposure can lead to reduced levels of mood-boosting neurotransmitters, including dopamine, and that sunlight exposure can increase them (50, 51).One study in 68 healthy adults found that those who received the most sunlight exposure in the previous 30 days had the highest density of dopamine receptors in the reward and movement regions of their brains (52).While sun exposure may boost dopamine levels and improve mood, it's important to adhere to safety guidelines, as getting too much sun can be harmful and possibly addicting.One study in compulsive tanners who visited tanning beds at least two times per week for one year found that tanning sessions led to significant boosts in dopamine levels and a desire to repeat the behavior (53).Additionally, too much sun exposure can cause skin damage and increase the risk of skin cancer, so moderation is important (54, 55).It's generally recommended to limit sun exposure during peak hours when ultraviolet radiation is the strongest, typically between 10 am and 2 pm, and to apply sunscreen whenever the UV index is above 3 (56).Summary Sunlight exposure can boost dopamine levels, but it's important to be mindful of sun exposure guidelines to avoid skin damage.Your body requires several vitamins and minerals to create dopamine. These include iron, niacin, folate and vitamin B6 (57, 58, 59).If your body is deficient in one or more of these nutrients, you may have trouble making enough dopamine to meet your body's needs (60).Blood work can determine if you are deficient in any of these nutrients. If so, you can supplement as needed to bring your levels back up.In addition to proper nutrition, several other supplements have been linked to increased dopamine levels, but thus far, research is limited to animal studies.These supplements include magnesium, vitamin D, curcumin, oregano extract and green tea. However, more research is needed in humans (61, 62, 63, 64, 65).Summary Having adequate levels of iron, niacin, folate and vitamin B6 is important for dopamine production. Preliminary animal studies suggest that some supplements may also help boost dopamine levels, but more human research is needed.Dopamine is an important brain chemical that influences your mood and feelings of reward and motivation. It helps regulate body movements as well.Levels are generally well regulated by the body, but there are a few diet and lifestyle changes you can make to boost your levels naturally.A balanced diet that contains adequate protein, vitamins and minerals, probiotics and a moderate amount of saturated fat can help your body produce the dopamine it needs.For people with dopamine deficiency diseases, such as Parkinson's, eating natural food sources of L-dopa like fava beans or Mucuna pruriens may help restore dopamine levels.Lifestyle choices are also important. Getting enough sleep, exercising, listening to music, meditating and spending time in the sun can all boost dopamine levels.Overall, a balanced diet and lifestyle can go a long way in increasing your body's natural production of dopamine and helping your brain function at its best.