

NIH News in Health

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Strike a Chord for Health

Music Matters for Body and Mind

Music can lift you up. It can bring tears to your eyes. It can help you relax or make you get up and dance. You probably hear it several times a day—on the radio or TV, in the supermarket, at the gym or hummed by a passerby. Music's been with us since ancient times, and it's part of every known culture. Music strikes a chord with all of us.

"There's something about music and engaging in musical activities that appears to be very stimulating for the brain and body," says neuroscientist Dr. Petr Janata of the University of California, Davis. Singing favorite songs with family and friends, playing in a band or dancing to music can also help you bond with others. "It's a way of synchronizing groups of people and engaging in a common activity that everyone can do at the same time," Janata adds.

NIH-funded scientists are exploring the different ways music can influence our bodies and minds. Their research may also shed light on creative processes. Ultimately, scientists hope to harness the power of music to develop new treatments for people with stroke, autism and many other conditions.

Several well-controlled studies have found that listening to music can alleviate pain or reduce the need for pain medications. Other research suggests that music can benefit heart disease patients by reducing

their blood pressure, heart rate and anxiety. Music therapy has also been shown to lift the spirits of patients with depression. Making music yourself—either playing instruments or singing—can have therapeutic effects as well.

Scientists have long known that when music and other sounds enter the ear, they're converted to electrical signals. The signals travel up the **auditory** nerve to the brain's auditory cortex, which processes sound. From there, the brain's responses to music become much more complex.

Over the past decade, new brain imaging techniques have shown that music activates many unexpected brain regions. It can turn on areas involved in emotion and memory. It can also activate the brain's motor regions, which prepare for and coordinate physical movement.

One brain area that's drawn interest in recent years is the medial prefrontal cortex, located just behind the eyes. In a recent study, Janata showed that this region seems to be a central hub linking music, memories and emotion. He used an imaging technique called fMRI to look at the brains of young adults while they listened to snippets of songs from their childhoods. When they heard familiar songs, the medial prefrontal cortex lit up. Activation was strongest when the song evoked a specific memory or emotion.

"It turns out that the medial



prefrontal cortex is also one of the last brain regions to deteriorate in Alzheimer's disease," Janata says. This may help explain why many Alzheimer's patients can remember and sing along to tunes from their youth when other memories are lost. Janata hopes to conduct studies of older adults—including some with mild thinking impairments—to see how the brain processes nostalgic songs.

The medial prefrontal cortex also seems to play a role in the creative expression of music. Dr. Allen Braun, a scientist at NIH's National Institute on Deafness and Other Communication Disorders (NIDCD), and Dr. Charles Limb of Johns Hopkins University

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Definitions

Auditory

Related to hearing

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asked jazz musicians to play music on a keyboard inside an MRI scanner. When improvising, the musicians' medial prefrontal cortex turned on. But the region wasn't activated when they were playing memorized scales.

Meanwhile, a different brain area that's involved in self-monitoring shut down during improv. "The musicians were letting go and not watching themselves as much while improvising," says Braun.

Unfortunately, for some people listening to music can be an unpleasant challenge. About 1 in 50 people have a disorder called tune deafness. They have trouble hearing the differ-

ences between musical tones. They can't carry a tune.

"The most severely affected people can't even recognize it as music. To them it just sounds like traffic noise," says geneticist Dr. Dennis Drayna of NIDCD. Nearly 10 years ago, he and his colleagues studied twins and showed that both tune deafness and perfect pitch are inherited.

"People with tune deafness can pass a standard hearing test with flying colors, but something we don't yet understand is drastically wrong with their auditory system," he says.

A new clue came from a recent brain imaging study by Drayna and Braun. When a familiar tune hit a sour note, brain scans unexpectedly showed that tune deaf people registered the mistake, similar to people with normal hearing. However, the tune deaf people somehow didn't realize they'd heard a mistake. Their brains failed to produce a second signal that occurs when the brain doesn't hear what it expects.

"Somehow, the melodic structure of the music is processed unconsciously by these people, but they can't consciously recognize the errors," says Braun. Some researchers suspect that the brain processing errors that lead to tune deafness may also be at play in some learning and developmental disorders.

Several studies of musicians show that their brains are different from the rest of us. Over a decade ago, neuroscientist Dr. Gottfried Schlaug of Harvard Medical School found that professional musicians have an unusually thick bundle of nerves con-

**Web Links**

For links to more information about music and health, see this story online:
<http://newsinhealth.nih.gov/2010/January/feature1.htm>

necting the left and right sides of the brain. More recently, he's been watching the brain development of children since about age 6, when they first began learning an instrument.

Just 15 months into training, and also at 30 months, young musicians had more complex connections between different brain regions and more elaborate auditory and motor systems than kids who didn't play an instrument. "We found that kids who practiced the longest and with intensity had the most profound effects. Those who practiced the least did not show much of a difference compared to non-musicians," Schlaug says.

"When you make music, it engages many different areas of the brain, including visual, auditory and motor areas," says Schlaug. "That's why music-making is also of potential interest in treating neurologic disorders."

Schlaug's been exploring how music making may help adults regain their ability to speak after a stroke. When stroke damages the speaking area of the brain, some people can still sing words but not speak them. With an experimental technique called music intonation therapy, patients learn to sing and mimic the rhythms of simple songs. Gradually, different regions of the brain may take over some speaking functions.

"Although this therapy has been around for about 30 years, no one fully understands how it works," Schlaug says. With NIH funding, he's now conducting a clinical trial to study the effectiveness of this therapy. Results are expected in about 3 years.

Scientists continue to explore the relationship between music and health. While they search, try turning on the radio or grabbing your guitar. Enjoy whatever music brings your way. ■

**Wise Choices
Musical Activities**

Research suggests that music may help with pain, Alzheimer's disease and other medical conditions. Try the following activities:

- Play CDs, tapes or records.
- Attend a concert or musical program.
- Talk about the music, the singer or the memories the songs bring up.
- For those who play instruments, get together and play with friends and family.
- Sing or dance along together.
- Play musical games like "Name That Tune."

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Understanding Acne

How to Banish Breakouts

There are many myths about what causes acne. Some people blame foods for their outbreaks. Some think that dirty skin causes it. But there's little evidence that either has much effect on most people's acne.

People of all races and ages get acne. About 4 of every 5 people between the ages of 11 and 30 have outbreaks at some point. It's most common in adolescents and young adults. Although acne is usually not a serious health threat, it can be upsetting, and severe acne can lead to permanent scarring. Fortunately, for most people, acne tends to go away by the time they reach their 30s.

Acne begins in the skin's oil glands. The oils travel up a canal called a follicle, which also contains a hair. The oils empty onto the skin surface through the follicle's opening, or pore.

The hair, oil and cells that line the narrow follicle can form a plug and

block the pore, preventing oil from reaching the skin's surface. This mix of oil and cells allows **bacteria** that normally live on the skin to grow in plugged follicles. Your body's defense system then moves to attack the bacteria and the area gets inflamed.

If the plugged follicle stays beneath the skin, you get a white bump called a whitehead. If it reaches the surface of the skin and opens up, you get a blackhead. It's not because of dirt; the oil becomes black on the skin's surface when it's exposed to air. Both whiteheads and blackheads may stay in the skin for a long time. Eventually, the wall of the plugged follicle can break down, leading to pimples, or zits.

One important factor in acne is an increase in certain **hormones** during puberty. These hormones cause the oil glands to enlarge and make more oil. Hormone changes related to pregnancy or starting or stopping birth control pills can also cause acne.

Studies suggest that you can inherit a tendency to develop acne from your parents, so genes likely play some role. Stress doesn't cause acne, but research has found that for people who have acne, stress can make it worse.

Certain drugs are also known to cause acne. Greasy cosmetics, for example, can alter the cells of the follicles and make them stick together, producing a plug. If you have acne, try oil-free cosmetics. Choose



products labeled noncomedogenic (meaning they don't promote the formation of closed pores).

If you have acne, don't rub or touch your pimples. Squeezing, pinching or picking at them can lead to scars or dark blotches. Gently wash your face with a mild cleanser twice a day—and after heavy exercise. Don't use strong soaps or rough scrub pads; they may make the problem worse. It's also important to shampoo your hair regularly. If you have oily hair, you may want to wash it every day.

Several over-the-counter medicines can treat mild acne. It may take up to 8 weeks before you notice an improvement. For more severe acne, talk to your doctor about the options.

Researchers continue to work on developing new drugs to treat acne. They're also trying to better understand the causes of acne so they can explore new remedies. In the meantime, there are several available treatments that may help. ■



Wise Choices Acne Flare-ups

The exact cause of acne is unknown, but certain factors can cause it to flare. They include:

- Changing hormone levels in adolescent girls—and adult women 2 to 7 days before their menstrual period starts
- Oil from skin products (moisturizers or cosmetics) or grease in the work environment (for example, a kitchen with fry vats)
- Pressure from sports helmets or equipment, backpacks, tight collars or tight sports uniforms
- Skin irritants, such as pollution and high humidity
- Squeezing or picking at blemishes
- Hard scrubbing of the skin
- Stress



Definitions

Bacteria

A type of microbe.

Hormones

Molecules sent through the bloodstream to signal another part of the body to grow or react a certain way.



Web Links

For links to more information about acne, see this story online:

<http://newsinhealth.nih.gov/2010/January/feature2.htm>



Health Capsules

For links to more information, see these stories online:
<http://newsinhealth.nih.gov/2010/January/capsules.htm>

Restricting Sugary Food May Backfire

Do you try to lose weight by putting certain foods off-limits? Depriving yourself of the foods you love, new research in rats suggests, might drive you to eat more of those foods later.

NIH-funded researchers recently found that rats given occasional access to sugary food ate less of their normal food even when sweet food wasn't available. When the sweet food became available again, they overate it. In other words, the rats were holding out for the good stuff.

The researchers suspect the brain's stress system might be behind this behavior. Withdrawal problems for drugs of abuse are driven by the brain's fear, anxiety and stress response. Could something similar

happen when you deprive yourself of certain foods?

The scientists tested a drug that blocks the action of CRF, a molecule involved in the brain's response to stress. CRF has been tied to withdrawal for every major drug of abuse.

The team divided rats into 2 groups. One received cycles of 5 days of regular chow and 2 days of sweet chow. The other was given only regular food. All the rats could eat as much as they wanted. After 7 weeks, the rats were given the CRF-blocker.

The blocker blunted the rats' bingeing. The diet-cycled rats ate more regular chow and then, when it was available, less of the sweet. The drug also blocked the rats' anxious

behavior when the sweet food was withdrawn. It had no effect on the rats eating only normal chow.

When eating regular chow, the diet-cycled rats had much higher CRF levels in a brain region involved in fear, anxiety and stress. CRF levels were normal, however, when they were fed the sweet food.

Human eating behavior is more complicated than rats, of course. But these findings suggest that cutting out certain foods may cause you to feel stressed until you eat those foods again. Research shows that the best way to lose weight is to change your lifestyle to eat healthier and get more physical activity. ■

Mental Disorders in Youth

About half of American children and teenagers who have certain mental disorders don't receive professional services, according to a new study.

Researchers interviewed over 3,000 children and adolescents, ages 8 to 15. Parents or caregivers also provided information about the children's mental health and what treatment, if any, they were receiving. The researchers tracked 6 mental disorders—generalized anxiety disorder, panic disorder, eating disorders (anorexia and bulimia), depression, attention deficit hyperactivity disorder (ADHD) and conduct disorder.

Overall, 13% of the youth had signs of at least 1 of the 6 mental disorders within the last year. About 1.8% had

more than one disorder, usually a combination of ADHD and conduct disorder. ADHD was the most common (8.6%), with depression second most common (3.7%).

Overall, 55% of those with a disorder had consulted with a mental health professional. African-Americans and Mexican-Americans were significantly less likely to seek treatment than whites, however. The researchers say this highlights the need to identify and remove barriers to treatment for minority youth.

"The data will provide a valuable basis for making decisions about health care for American youth," says lead author Dr. Kathleen Merikangas of NIH. ■

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