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March/April 2014

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Your Own Lies
(everybody does)
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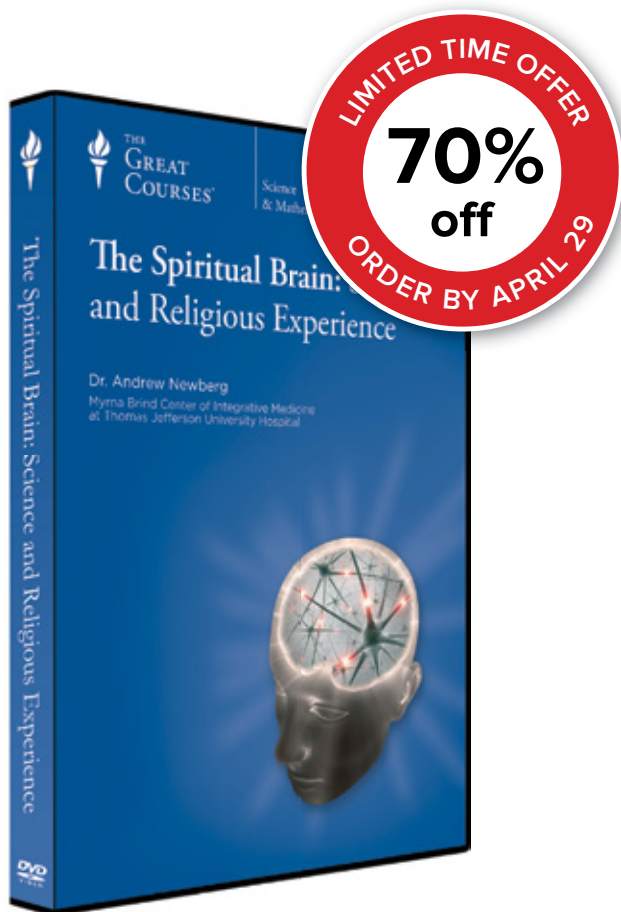
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Some of the articles in Scientific American Mind are adapted from articles originally appearing in Gehirn & Geist.



Shaping Young Minds

It just may be one of the most underappreciated health problems in the U.S. today: As many as one in five children experience a mental disorder in a given year. The effects can be lasting, reducing their life satisfaction and productivity for years if their symptoms go undiagnosed and untreated.

For these reasons, in this issue's special report, "Calming a Child's Mind," we highlight emerging therapies for the three most prevalent childhood disorders— anxiety, behavior or conduct disorder, and attention-deficit hyperactivity disorder (ADHD). Psychologist Jerry Bubrick leads off the section on page 46 with his account of helping several young patients overcome anxiety in "Fear Not, Child." In "Behave!" beginning on page 54, staff editor Ingrid Wickelgren drops in on a parent-training program that helps moms and dads build healthier relationships with their recalcitrant offspring. And contributing editor Emily Laber-Warren explores a growing trend to treat signs of ADHD at ages four or five, before the disorder can be officially diagnosed. Turn to page 61 for more.

Rough patches in childhood can become defining moments, helping to shape many aspects of personality. One such facet is how strongly you strive to either stand out or fit in. Psychologist Hans-Peter Erb and biologist Susanne Gebert explore the forces at work in forging character in "Uniquely You," starting on page 26. To make the most of your special traits, you must be able to think critically about who you are—a skill that psychologist John D. Mayer calls "personal intelligence." In "Thinking about Tomorrow," beginning on page 34, Mayer describes the role of personal intelligence in setting realistic goals and feeling in tune with your future self.

The adage to "know thyself" is as relevant today as it was in the time of ancient Greece, but the tools we can use for that discovery are changing rapidly. We possess stronger, more effective methods for improving well-being than ever before—and that is welcome news for all of us.

Sandra Upson
Managing Editor
editors@SciAmMind.com

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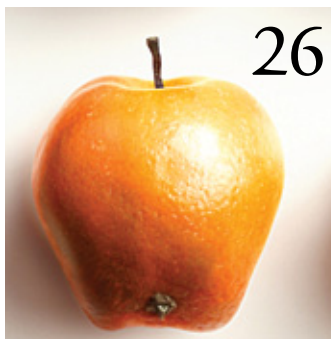
An interactive parent-training program can stamp out behavior problems in kids—and abuse from parents.

BY INGRID WICKELGREN

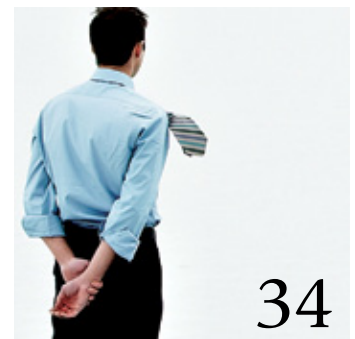
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Editors' note: Christof Koch's column Consciousness Redux will return in the next issue of *Scientific American Mind*.

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UNCONSCIOUS BIAS?

As a subscriber to *Scientific American Mind*, I was very disappointed to see your cover story “Seven Deadly Sins” illustrated by a dark-skinned woman. Centuries of negative, harmful stereotyping have associated women with sin and portrayed non-Caucasians as dangerous. Did no one question this choice during the design process?

The table of contents page uses a compelling graphic, and any number of images of white male devils could have been used. Instead someone chose to reinforce the meme that dark-skinned females are evil. Or was there an overriding need to have a sexy photo on the newsstand?

Please reread your own articles about unconscious bias and make more enlightened artwork selections in the future.

Joanna Cazden
 Burbank, Calif.

What on earth were you thinking to illustrate the title “Seven Deadly Sins” with a portrait of a young woman of color, rather than, say, a young white man? As the mother of a young biracial girl, seeing this sort of thoughtless, antebellum-era racism by a “scientific” periodical, and seeing this image coupled with this title in supermarkets across the country, chills me to the bone.

I have enjoyed newsstand copies of this magazine for years. Never again.

Maureen de Zeeuw
 via e-mail

MORAL OBJECTIONS

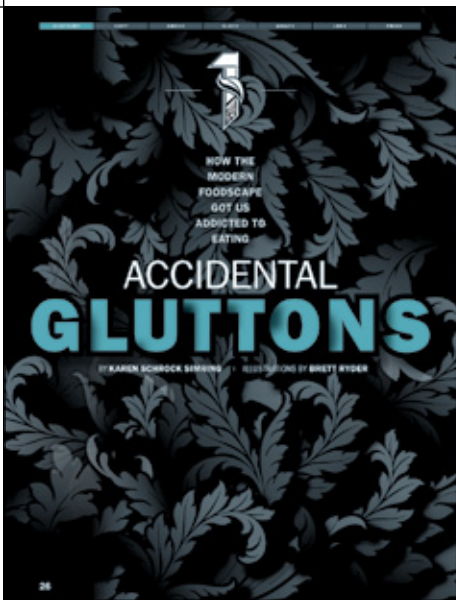
When reading Jesse Bering’s article, “That’s Disgusting” [Perspectives], I was surprised to see the author give no argument for his very counterintuitive and controversial position on morality. Moral nihilism, he says, is a “healthy antidote” for the stigma associated with certain cultures’ sexualities. But how is “healthy” here supposed to be understood? If moral nihilism is the case, then we have no moral reasons to adopt this attitude; all we would have are motivations of self-interest—in which case moral nihilism’s being the healthier attitude becomes an empirical claim. As it stands, I’d say it’s an empirically dubious one.

It’s also important to notice that ethicists (those who study morality) haven’t felt the need to discuss sexuality for decades (and probably for reasons that Bering himself would adduce). That Westerners err in their moral judgments regarding that topic would only be a good reason to recommend moral nihilism if the ethical study of sexuality constituted a considerable portion, or all, of ethics. But it doesn’t now, and it never has.

Toward the end of the article, Bering says, “To adopt the most clear-sighted stance on these increasingly slippery subjects, we must remember to take deviance within its given context, and harm must be understood as harm experienced by the parties involved, not by us as ‘disgusted’ onlookers.” This is a healthy recommendation. And this recommendation is wholly compatible with one of the pillars of contemporary ethical theory, utilitarianism, the (objective) theory of morality under which harm—anyone’s—is the only bad (and well-being the only good).

So it is unusual that Bering recommends we abnegate something so central to social living, morality, when our only reasons to do so are in keeping with one of the major theories of it.

Last, it may well be true that morality is “not out there in the world,” as Ber-



ing says. But he gives us no reason at all to suspect that it isn't.

William A. Sharp
San Antonio

SUGAR ADDICTION

In **"Accidental Gluttons,"** by Karen Schrock Simring, the Fast Facts box reads, "Although the concept of food addiction is controversial ..." No one tries to say that "food" is addictive. Hamburger, cauliflower and walnuts do not cause tachyphylaxis, physical dependency and withdrawal, which are the hallmarks of addiction. Sugar does produce all these phenomena plus neuroanatomical imaging patterns that show undeniable and startling similarities with abusive drug use. Fats, salt and high glycemic carbs may have similar results, but the jury is still out.

"Barugna"

commenting online at
www.ScientificAmerican.com/Mind

ADMIRATION IS NOT ENVY

Why is half of the article "Untangling Envy," by Jan Crusius and Thomas Mussweiler, confusing admiration with envy? Wanting to be like someone in a positive way (improving oneself) is not a form of envy. It is a positive response to admiration.

"tuned"

commenting online at
www.ScientificAmerican.com/Mind

A CUT FOR RELIEF

I definitely agree with the premise of "The Cutting Edge" [Facts and Fictions in Mental Health], by Hal Arkowitz and Scott O. Lilienfeld, which states that a large part of the motivation to cut is pain relief. I used to cut myself. It was a quick, predictable, effective and potent way to relieve intrapersonal distress and emotional pain.

I suffered depression for decades, from an early age. When I was younger, I did not have the insight or vocabulary of emotional experience to comprehend and examine what I was going through, let alone to talk about it with anybody else. I found treatment with drugs only minimally effective. My inability to describe what was going on inside myself made talk therapy simply futile. Cutting myself was the only thing that I found that had any effect at all.

When I did cut, it would be when I was at my most desperate. Immense emotional pain, distress, inability to see any way that pain could end, that life could become good again; this was my state of mind.

The first instant of pain signals the onset of relief. Immediately I am totally, completely focused on my singular action. Thoughts, emotions, feelings, worries—everything disappears, and all that exists is my arm, the

blade, the blood, the burning: simple, basic, immediate, understandable things. No longer do I feel torn apart from the inside out, no more dread, no more wanting to die. Nothing exists but a bright, blinding white feeling. No more pain, my mind is still. I am back in a world that I understand. I float on calm waters.

After writing this, I now see that the relief of pain was not my sole motivation for cutting. Another critical element was regaining control of my inner world. Loss of control is a key fact of mental illness; being able to relieve pain is extremely empowering.

"kebil"

commenting at
www.ScientificAmerican.com/Mind

EMOTIONAL METAPHORS

In response to "Hidden Metaphors Get under Our Skin" [Head Lines], by Tori Rodriguez: The idea of the concrete metaphor comes from literary theory, of all places, and has since been taken up by cognitive and artificial-intelligence scientists. It says that the brain basically works by comparing the unknown to known and embodied metaphors as a kind of pattern recognition. Writers and artists have instinctively used metaphor for centuries to add depth and meaning to their work, such as where a landscape or setting reflects and reveals the subjects' moods. I think the fact that metaphor has emotional as well as intellectual meaning makes it a good candidate for exploring the bridge between thought and emotion.

"dr_mabeuse"

commenting online at
www.ScientificAmerican.com/Mind

DIGITAL PAT ON THE BACK

Your magazine, obviously, is fantastic with great articles. I'm writing to say that your iPad app is equally good. It's wonderful to navigate. The people who made it deserve much praise.

Thank you!

Taimur Habib
via e-mail

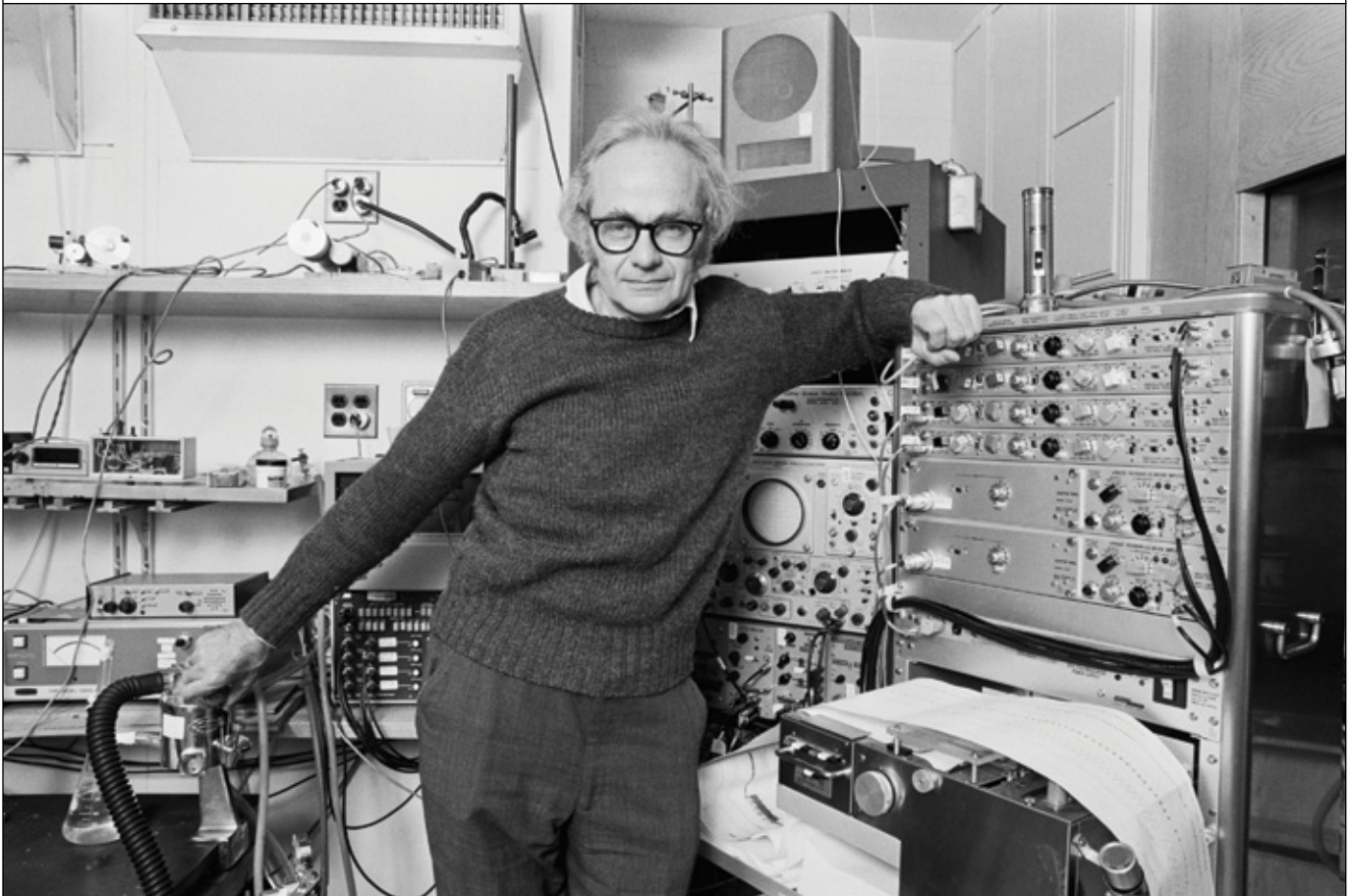
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David Hubel's Vision

A Nobel Prize–winning neuroscientist and his quest to crack the brain's visual code

BY SUSANA MARTINEZ-CONDE AND STEPHEN L. MACKNIK



I must admit that what most strongly motivates me ... is sheer curiosity over the workings of the most complicated structure known.

—David H. Hubel (1926–2013)

IN 1958 neurophysiologist David H. Hubel and his new research partner, Torsten N. Wiesel, were working like dogs to understand how cats see the world. They routinely pulled all-nighters in Stephen Kuffler's laboratory at the Wilmer Eye Institute at Johns Hopkins University. One of them would insert thin tungsten electrodes into the anesthetized cats' brains, plugging into neurons in area 17—the first region of the cortex that processes visual information. The other would use a modified ophthalmoscope fitted with glass slides to shine different patterns of light into each animal's eyes. The elec-

trodes were connected to a machine that converted any electrical activity in the brain cells into sounds. Hubel and Wiesel listened carefully for signs of rapidly firing neurons.

For a long time they heard little of interest. Why was this so hard? They were eavesdropping on the brain's *visual* system, right?! Surely they should hear robust activity. Neurons in the retina—the light-sensitive tissue at the back of the eyes—readily responded to spots and rings of light. And neurons in the visual thalamus—the part of the brain connected directly to the retina—dutifully react-

ed to information relayed from the retina. So why wouldn't cortical neurons, just one level up in the visual hierarchy, also respond in kind? It was infuriating. All the more so because other scientists had warned Hubel and Wiesel that this is exactly what would happen. Again and again neurophysiologists like them had tried, and failed, to crack the visual cortex's code.

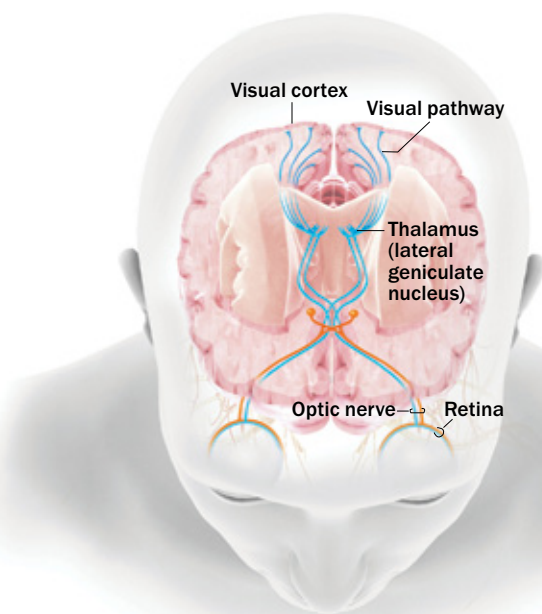
But Hubel and Wiesel were relentless. Unraveling the workings of the cortex was critical not only to understanding vision but also to illuminating the very part of the brain that makes us hu-

IRA WYMAN Corbis

man. The architecture of the cortex looks more or less the same whether you are in the frontal lobe, the auditory temporal lobe or the visual occipital lobe.

One day while conducting their usual experiments, a machine gun barrage of neural impulses surprised them both. Where did that come from? The neuron in question seemed to be teasing them, firing whenever they inserted a new glass slide onto the ophthalmoscope but then falling silent again. Something momentous was happening that they could not yet grasp. Worse, they felt they were running out of time. Often they could only record from the same neuron for just a few minutes, maybe an hour or two, before it died or slipped off the end of the electrode. Fortunately, an explanation struck them like a lightning bolt. Perhaps the neuron was not responding to the patterns of light and shadow made by the slides but rather to the edge of each new slide as it slid into the ophthalmoscope.

Exhilarated, Hubel and Wiesel continued to study the neuron as the hours ticked by. After presenting the brain cell with all kinds of visual patterns—in their previous studies they had tried everything from their own faces to pictures of glamorous female models—they finally concluded that this potentially history-changing neuron responded only to lines and edges that were oriented in specific angles. They could think of no further tests to conduct and looked at



THE PRIMARY VISUAL CORTEX

Also known as area V1 and Brodmann area 17, the primary visual cortex is located in the brain's occipital lobe. The largest of the more than a dozen cortical areas involved in the processing of visual information, Hubel used to describe it as "the size of a credit card."

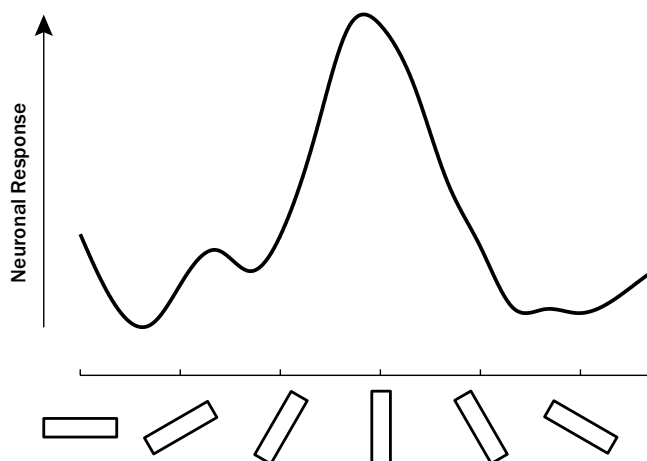
the clock. They had been studying the neuron for nine hours straight.

The primary visual cortex's secret fascination with orientation was the first of many groundbreaking discoveries that Hubel and Wiesel coaxed from the brain—for which they won the Nobel Prize in Physiology or Medicine in 1981. From this original finding, Hubel, Wiesel and others went on to discover cortical neurons that favored other specific attributes of the visual world, such as preference for specific colors, direction of motion, and even specific objects, such as hands and faces.

In memory of our dear friend and mentor, David Hubel, who died in Sep-

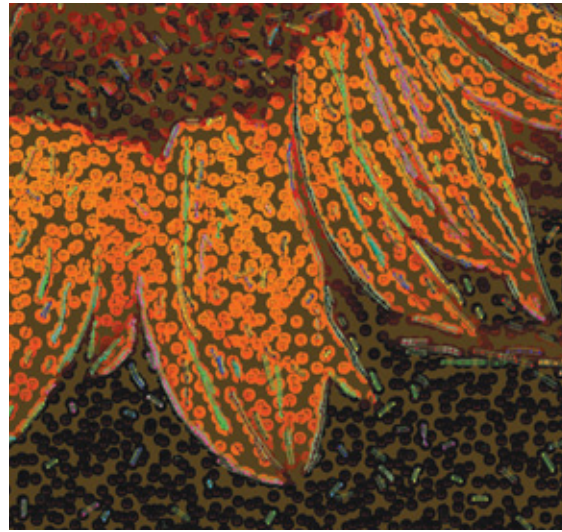
tember 2013 at the age of 87, we show some of the most beautiful and interesting perceptual implications of Hubel and Wiesel's initial breakthrough. **M**

SUSANA MARTINEZ-CONDE and STEPHEN L. MACKNIK are laboratory directors at the Barrow Neurological Institute in Phoenix. They serve on *Scientific American Mind's* board of advisers and are authors of *Sleights of Mind: What the Neuroscience of Magic Reveals about Our Everyday Deceptions*, with Sandra Blakelee, which recently won the Prisma Prize for Best Science Book of the Year (<http://sleights ofmind.com>). Their forthcoming book, *Champions of Illusion*, will be published by Scientific American/Farrar, Straus and Giroux.



THE SCIENCE OF ORIENTATION SELECTIVITY

Hubel and Wiesel found that whereas retinal neurons preferred dots, an otherwise quiescent cortical neuron would respond vigorously if and only if a straight line, oriented at just the right angle (say, 12 o'clock), was swept across the appropriate location on the retina. The graph shows a cortical neuron's responses (in the form of neuronal impulses, also called action potentials) to bars of different orientations. For this particular neuron, a vertically oriented bar elicited the strongest responses. From such findings, Hubel and Wiesel deduced that the higher a neuron is located in the brain's visual pathway—which stretches from the retina to the farthest regions of cortical tissue—the more complex the stimulus it responds to, for example, dots versus lines versus entire shapes. This type of hierarchy turned out to be fundamental to brain organization overall.



THE ART OF ORIENTATION SELECTIVITY

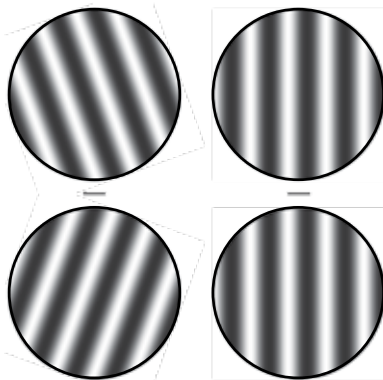
In the 19th century artists such as Georges Seurat and Camille Pissarro pioneered a new kind of painting called pointillism in which many carefully placed dots of color collectively form an image. Many decades later Norbert Krüger and Florentin Wörgötter created a type of digital art modeled on pointillism. This sunflower (left) is an example. Thousands of your orientation-selective visual neurons work in tandem to help your brain form a picture of the flower's contours. A close-up view (right) reveals how visual

neurons in the cortex extract orientation information from the image. Each symbol represents the region of the image "seen" by one simulated neuron in the primary visual cortex. The color, lines and arrows in each dot represent the preferences of the activated neuron, based on Hubel and Wiesel's discoveries. The outputs of this neuronal network feed into downstream neurons that respond to increasingly complex shapes and eventually "see" the big picture—in this case, a sunflower.



CORTICAL PHYSIOLOGY IN THE ART MUSEUM

Lines, rectangles and other elongated solid shapes with varying orientations feature prominently in the minimalist art of Kazimir Malevich (left) and Jean Tinguely (right). One reason these creations are so arresting, says visual neuroscientist Semir Zeki of University College London, is that they make our primary visual cortical neurons fire like crazy.



AN ORIENTATION ILLUSION

Notice that the line gratings on the left are oblique, whereas the line gratings on the right are vertical. Stare at the short horizontal line between the gratings on the left for at least 30 seconds, then quickly move your gaze to the short line between the gratings on the right. Notice that the formerly vertical lines on the right circles now appear to lean. This occurs because different populations of visual cortical neurons are sensitive to different orientations. When your neurons look at oriented lines for a long enough time, the corresponding cortical detectors become less responsive than those that are tuned to different orientations—a process called adaptation.

FURTHER READING

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COURTESY OF NORBERT KRÜGER (sunflower); GETTY IMAGES (Malevich); MÉTA-MALEVICH, 1954. © 2013 PROLITTERIS. MUSEUM TINGUELY. PHOTOGRAPH BY CHRISTIAN BAUR (Tinguely); JIE CUI Martínez-Conde Laboratory, Barrow Neurological Institute (lines in circles)

Head Lines

IDEAS TO WATCH IN BRAIN SCIENCE



ILLUSTRATION BY STUART BRIERS

Food on the Brain 

M NEWS FROM OUR WEB SITE A new test can diagnose Alzheimer's disease from a brain scan. But as clinicians are asking, to what end?

» The Neuroscience of Unbalanced Eating

Why we often ignore hunger and satiety

WIRED TO STARVE

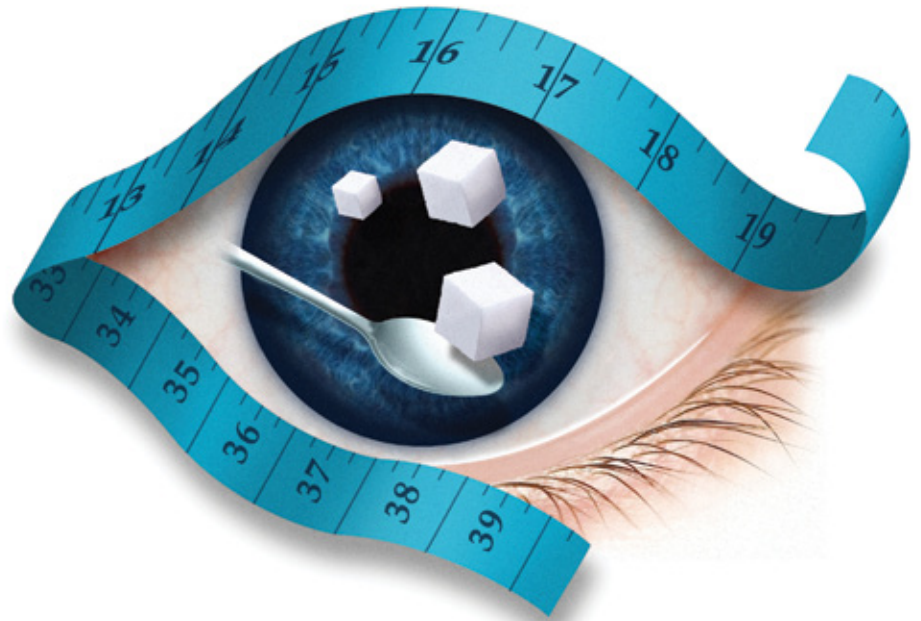
Eating disorders may arise from faulty reward responses in the brain

A dog will do anything for a biscuit—over and over again. Most people will, too, because when sugar touches the taste buds it excites reward regions in the brain. A new study shows that people with eating disorders do not react to sweet flavors the way healthy people do, however, lending evidence to the hypothesis that brain differences predispose people toward bulimia and anorexia.

A team of psychiatrists at U.C. San Diego studied 14 recovered anorexic women, 14 recovered bulimic women (who used to binge and purge) and 14 women who had never had an eating disorder, matched by age and weight. None of the women had had any pathological eating-related behaviors in the 12 months preceding the study. After fasting overnight, subjects received a modest breakfast to ensure similar levels of satiety. They were then fed small tastes of sugar every 20 seconds through a syringe pump while their brains were scanned.

The women who had recovered from anorexia—those who formerly starved themselves—showed less activity than the healthy women in a reward center in the brain known as the primary gustatory cortex. The participants who were no longer bulimic showed more activity than the healthy women did. The results were published in October 2013 in the *American Journal of Psychiatry*.

The researchers believe these abnormal responses to sugar predispose people to eating disorders, adding to a growing body of work suggesting that genetic and biological risk factors underlie most cases, according to study co-author Walter Kaye, director of U.C.S.D.'s Eating Disorders Research and Treatment Program. Kaye acknowl-



edges that the finding could instead reflect a consequence of an eating disorder that persists after recovery, but he thinks it is less likely. Given our culture's fixation on body image and thinness, if nonbiological factors such as social pressure were enough to trigger eating disorders, anorexia would be rampant, Kaye says. Yet only 0.5 percent of women in the U.S. are anorexic, a figure that has held steady for decades.

Whether a cause or effect of eating disorders, the abnormal brain activity has important implications for how we treat patients, according to physician Laura Hill, chief clinical officer of the Center for Balanced Living, a clinic specializing in eating disorders in Columbus, Ohio. "People will say [to anorexics] just be mindful of your eating. They can't be mindful. There is no response in the brain to say, 'Let me get a sense of how I should eat and when I should eat.'

It's just not firing," she says. Instead successful therapies use experiential activities that teach patients how to compensate for their brain's irregular responses. —Shannon Firth

When dopamine floods the brain, healthy individuals feel euphoric, whereas people with anorexia experience anxiety. Sugary treats prompt a dopamine rush—pleasurable for most people but not for anorexics.

STUART BRIERS



Sex Hormone Lessens Snacking

Oxytocin reduces pleasure eating without interfering with normal hunger

Add another credential to oxytocin's impressive resume: the hormone crucial for bonding also reduces the calories people consume when they are snacking for pleasure, making it a possible therapeutic target for obesity.

German researchers gave a group of men a dose of oxytocin thought to be roughly the amount released by the brain after breast-feeding or sex, according to lead author Manfred Hallschmid of the University of Tübingen. These men and another group who took a placebo then had a chance to eat as much as they wanted at a breakfast buffet, and later the same day they were offered snacks. Those who took oxytocin ate fewer snack calories, but the hormone did not change how much the men ate during the main meal, suggesting that oxytocin affected pleasure eating without suppressing normal appetite mechanisms.

The researchers hypothesize that the hormone diminished reward-seeking behavior initiated in the ventral tegmental area of the brain, a region found to be highly sensitive to oxytocin in rodent studies. The effect may also be stress-related: subjects who took oxytocin saw a drop in their levels of the stress hormone cortisol, according to the paper published in 2013 in the journal *Diabetes*. More work is needed to understand whether oxytocin could be used to treat obesity, but until then the finding at least hints that it may be possible to curb your cravings by having more sex. —Meredith Knight



Food Tastes Bland while Multitasking

Eating while distracted is well known to cause overindulgence, as confirmed by a recent review of 24 studies published in April 2013 in the *American Journal of Clinical Nutrition*. The exact mechanism behind such mindless bingeing, however, has been unclear. A recent study in *Psychological Science* suggests that mentally taxing tasks dampen our perception of taste, causing us to eat more. In four experiments, participants attempted to memorize either a seven-digit number (a heavy load on the brain) or one digit (a light cognitive load) while tasting salty, sweet and sour substances and rating each food's taste intensity. In all experiments, participants under the heavy cognitive load rated each type of taste as less intense, and they also ate more of the sweet and salty substances. The researchers believe cognitive load may compete with sensory input for our attention. Other studies have found that simply paying mindful attention to one's food—fully focusing on its taste, aroma and texture, for example—leads to less intake. This study adds yet another reason not to multitask at mealtime: your food will taste better. —Tori Rodriguez

When Eating Goes Awry



Insula

Processes feelings of hunger and other sensations, such as taste, flavor and texture
Less sensitive than normal in anorexia
More sensitive than normal in bulimia



Anterior cingulate cortex

Involved in decision making and anticipation of reward
Less active in response to food in anorexia
More active in response to food in bulimia



Dorsolateral prefrontal cortex

Regulates self-control
More active in anticipation of food in anorexia
Less active in anticipation of food in binge-eating disorder

STUART BRIERS (cookies and fork); ISTOCKPHOTO (brains)

can continue to elicit fear two generations later—at least in mice. | A new study suggests that gut bacteria can play a role in autism.

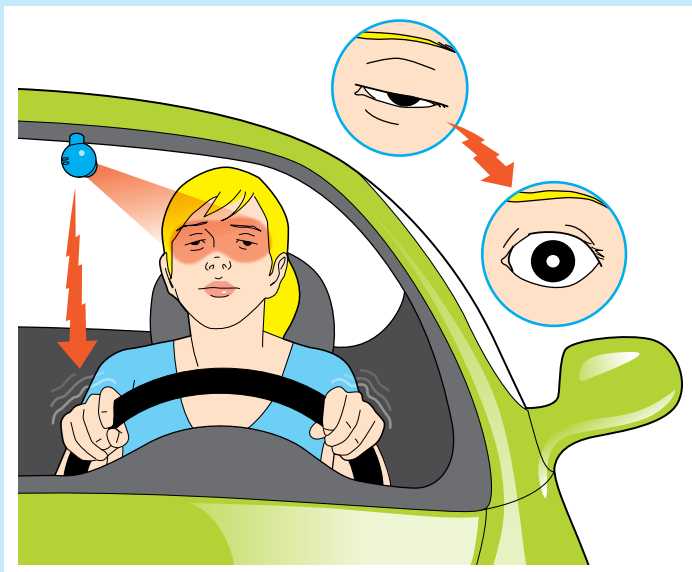
 ON THE HORIZON

EYE-TRACKING SOFTWARE THAT DETECTS MENTAL STATES

A car detects when a driver starts to nod off and gently pulls over. A tablet or laptop senses its user is confused and offers assistance. Such interventions seem futuristic, but in fact they may not require any technological breakthroughs: a recent study suggests that with the aid of a standard camera, a simple computer program can learn to read people's eye movements to determine what they are doing and perhaps how they are feeling.

Psychologists at the University of South Carolina were curious if a computer could figure out what a person was up to based on their eye movements. They first had 12 people engage in four tasks, including reading lines of text and searching photographs for a specific printed letter. Each person repeated the tasks 35 to 50 times while a camera recorded how their eyes moved. Using a subset of those data, the team trained a simple computer program, called a naive Bayes classifier, to identify which of the four tasks each person was doing. In the remaining trials, the classifier correctly determined which task the person was working on 75 percent of the time, well above the 25 percent expected by chance.

Because the computer program is based on a flexible algorithm that is simple but powerful, this set-up could most likely be used to identify emotions or mental states such as confusion or fatigue, the researchers suggest in the paper, which appeared in Sep-



tember 2013 in *PLOS ONE*. With only a brief training period, a car's onboard computer—existing models are more than powerful enough—could learn how a driver's gaze changed as he or she became more exhausted. Further work, the authors suggest, could lead to devices capable of identifying and aiding people in need of assistance in a variety of situations. —Nathan Collins

» Fear of Holes

Trypophobia is a real aversion and may relate to unconscious associations

In the early 2000s many Internet users bonded over their common aversion to pictures that showed clustered arrays of small holes, such as a beehive or even the popped bubbles on the uncooked top of a pancake. For almost a decade “trypophobia,” literally “fear of holes,” was nothing more than an Internet phenomenon, but finally researchers have found evidence of its validity and investigated its possible cause.

The story begins with the growth of online image sharing; soon many people realized they shared a revulsion that could reach the level of nausea to photographs of clusters of holes. The term “trypophobia” appears to have been coined by an unidentified Irish woman in a post on a Web forum in 2005. The idea went viral: self-identified tryphobics formed a Facebook group, created an eponymous Internet domain and posted informational YouTube videos. A Wikipedia article was repeatedly created and repeatedly deleted for lack of reliable sources.



The lotus seed head is a powerful trigger of revulsion in self-described tryphobics.

Four years ago two psychologists at the University of Essex in England, Geoff Cole and Arnold Wilkins, decided to research the phenomenon. They showed a picture of a lotus seed head—anecdotally a potent trigger of the phobia—to 286 adults aged 18 to 55 years old. Eleven percent of men and 18 percent of women described the seed head as “uncomfortable or even repulsive to look at,” indicating a level of revulsion on par with phobia.

Cole and Wilkins theorized that the visual structure of the image causes at least part of the unease. They analyzed a set of aversion-inducing photographs and images of holes

that did not trigger tryphobia and found that most of the disagreeable pictures shared an underlying mathematical structure that incorporates small, high-contrast features such as dots or stripes. This spectral pattern is seen in the skin coloration of many species of dangerous or poisonous animals; past studies have found that most people find this pattern uncomfortable to look at. Indeed, a variety of images taken from the Web site tryphobia.com produced discomfort in a group of 20 people who did not have the full-blown phobia.

These spatial characteristics explain at least some of the discomfort caused by pictures of small holes, but Wilkins acknowledges that something more is needed to explain the intensity of revulsion in sensitive people. The crucial factor might be an association with skin lesions such as scars or sores—those with tryphobia often say that the sight of clustered holes makes their skin crawl, and pictures of holes in skin are particularly potent. The emerging story, then, is that “fear of holes” may be a form of the universal aversion to scars and sores—an evolved trait that may have helped our ancestors avoid germs and disease—extended to objects such as lotus seed pods and honeycombs.

—William Skaggs

SCOTT DUNLAP (sun icon); JASON LEE (illustration); THINKSTOCK (lotus seed head)

M The attractiveness of cheerleaders is in part a visual illusion. We tend to find people in a group more beautiful than a solo operator.

SHOULD CHILDREN TAKE ANTIPSYCHOTIC DRUGS?

Prescriptions are on the rise, but evidence for the drugs' safety and effectiveness is mixed

Modern antipsychotic drugs are increasingly prescribed to children and adolescents diagnosed with a broad variety of ailments. The drugs help to alleviate symptoms in some disorders, such as schizophrenia and bipolar disorder, but in others their effectiveness is questionable. Yet off-label prescribing is on the rise, especially in children receiving public assistance and Medicaid. Psychotic disorders typically arise in adulthood and affect only a small proportion of children and adolescents. Off-label prescriptions, however, most often target aggressive and disruptive behaviors associated with

attention-deficit hyperactivity disorder (ADHD). "What's really concerning now is that a lot of this prescription is occurring in the face of emerging evidence that there are significant adverse effects that may be worse in youth than in adults," says David Rubin, a general pediatrician and co-director of PolicyLab at Children's Hospital of Philadelphia. Here we review the evidence for the effectiveness of antipsychotic medications commonly prescribed for five childhood conditions. But do the benefits outweigh the risks?

—Roni Jacobson

Schizophrenia

Evidence from several randomized controlled trials conducted in the past 10 years strongly suggests that antipsychotics are an effective treatment for youths with schizophrenia. Indeed, the FDA has approved five medications—risperidone, aripiprazole, olanzapine, quetiapine and paliperidone—for use in adolescents aged 13 to 17.

Bipolar Disorder

Recent research indicates that antipsychotics may hasten the resolution of manic and mixed episodes in children with bipolar disorder and increase the likelihood that the illness will go into remission. The FDA has approved the same set of drugs for 10- to 17-year-olds with bipolar disorder as it has for youths with schizophrenia, with the exception of paliperidone.

Autism

The FDA has approved risperidone and aripiprazole for the treatment of behavioral problems associated with autism spectrum disorder in children as young as five or six. Both medications have been found to reduce irritability, aggression, self-injury, tantrums and mood swings in children with autism. In one of the largest studies to date, risperidone reduced behavioral symptoms and lessened the rigid interests and repetitive behaviors typical of autism, but it had no effect on social and communication deficits.

ADHD and Disruptive Behavior Disorders

Doctors frequently prescribe antipsychotics to young people with conduct disorder, oppositional defiant disorder or ADHD, even though the drugs are not approved for these conditions. In a 2012 review of eight randomized controlled trials that took place between 2000 and 2008, researchers concluded that modern antipsychotics diminished aggressive tendencies in children with disruptive behavior disorders, but the effects were only marginally significant. A 2011 survey of off-label uses of these antipsychotics found that evidence supporting their effectiveness in children diagnosed with ADHD alone was "low or very low."

OCD and Tourette's Syndrome

Studies have indicated that risperidone and quetiapine can improve symptoms of obsessive-compulsive disorder (OCD) in adults when used in combination with an antidepressant, but several case reports suggest that such antipsychotics may worsen or induce new OCD symptoms and anxiety in children. Several open-label trials, in which both the researchers and participants are aware of what treatment the participants are receiving, have found that antipsychotics can reduce compulsions and tics in children, but more rigorous study is needed.



Prescriptions on the Rise

Between 2002 and 2009 pediatric prescriptions for atypical antipsychotics increased by 65 percent, from 2.9 million to about 4.8 million. A staggering 90 percent of those prescriptions are off-label, according to a 2012 study published in *JAMA Psychiatry*, with ADHD and disruptive behavior disorders accounting for about 38 percent of all antipsychotic use in children and teens. The increase may be partly caused by a "lack of alternative resources," Rubin says, because many doctors consider antipsychotic medication a stopgap or Band-Aid when therapy and other interventions are unavailable.

Are the Side Effects Worth It?

Modern antipsychotics, called "atypical" to distinguish them from the first generation of antipsychotic drugs, were initially promoted as a safer alternative to their forerunners. Yet it has become clear that atypical antipsychotics are associated with a host of serious side effects, such as weight gain, diabetes, high cholesterol and cardiovascular disease. In a study of 116 youths with early-onset schizophrenia, children taking risperidone gained eight pounds on average after taking the medication for eight weeks, whereas children taking olanzapine gained 13 pounds on average—prompting a safety review board to terminate the olanzapine arm of the trial early. Children taking antipsychotics are also three times more likely to develop type 2 diabetes than children not taking the medication, according to a 2013 study by researchers at Vanderbilt University.

In addition, risk of tardive dyskinesia—a neurological disorder resulting in compulsive movement—accompanies both classes of antipsychotics. A 2008 study found that it occurs in about 4 percent of patients taking atypical antipsychotics, compared with 5.5 percent for typical antipsychotics. Although the risk is higher with the older medications, an important caveat is that tardive dyskinesia usually occurs only after someone has taken the medication for years—longer than most clinical trials on atypical antipsychotics to date.

Turn to page 45 to learn more about behavioral therapies for ADHD, aggression and anxiety in children.

» Chemicals and the Developing Brain The risks, explained



Expectant parents have a lot on their mind these days. If the nightly news is to be trusted, dangerous pollutants lurk in our food, water and furniture, just waiting to invade a pregnant mom's body and harm the developing fetus. The early stages of brain development are indeed uniquely vulnerable to interference from foreign substances—prenatal exposure to many of these chemicals has been linked with lower IQ, behavior problems and mental disorders in kids. Yet the actual risk to a given individual varies widely and is often much lower than the headlines might lead you to believe. *Scientific American Mind* examined the research to date, as scientific understanding of the effects of environmental pollutants continues to grow.

What You Need to Know about Flame Retardants

Children with a genetic predisposition might be vulnerable to the effects of chemicals found in furniture and electronics



Flame retardants are a scary business: they have been tied to lower IQs, slowed cognitive development and undescended testes in young boys. Now research has linked prenatal exposure to a certain type of flame retardant to Rett syndrome, a disorder on the autistic spectrum—but scientists suspect that the chemicals may be most harmful to children who have other factors working against them.

Over the past 25 years, polybrominated diphenyl ethers (PBDEs) have been used as flame retardants in a wide range of consumer goods you probably already have in your home: textiles, mattresses, carpets, furniture and electronics. Once they're in your home, they tend to shed into house dust, which then gets picked up on your hands and clothes and breathed in through your lungs. Although we are still figuring out just what PBDEs do to the human body—and at what doses—there are some things we already know. For example, we know that they disrupt the body's use and regulation of thyroid hormones. These hormones are critical

for brain development in the womb and early childhood. PBDEs also have an unfortunate knack for sticking around in the environment, our food supply and in our body—particularly fatty tissue, including the brain, which is 60 percent lipids. For that reason, the Environmental Protection Agency now classifies PBDEs as persistent organic pollutants.

A wide array of research during the past few years has shown that PBDEs and their metabolites—what is left over when they break down in the body—are generally bad news. For example, as scientists in Seattle and Beijing discovered in 2013, PBDE-47 interferes with new neuron growth in adults—a process important for learning and memory. Developmental effects, however, are even more significant. Environmental health scientist Julie Herbstman of Columbia University found that children of mothers with higher concentrations of PBDEs in their umbilical cord blood scored lower on mental development tests in early childhood.

But perhaps the most damning evidence against PBDEs is their possible role in autism. For the past few years Janine LaSalle, a microbiologist at the MIND Institute at the University of California, Da-

vis, has been investigating how persistent organic pollutants, including PBDEs, may influence fetal neurodevelopment at the molecular level. When she and her team looked at brain slices from adults, some of whom had autism, they found that persistent organic pollutants, including PBDEs, were present in brain tissue in every sample. They were especially concentrated in the brains of people who had certain types of autism—types known to have significant genetic factors.

LaSalle also tested the effects of PBDEs on pregnant rats specially bred with the genetic mutation associated with Rett syndrome, which involves a lack of verbal ability, repetitive compulsive movements, and physical deformities such as small hands and head. In rats that received daily doses of PBDEs comparable with common human exposure, the female pups had social and behavioral deficits we usually associate with human autism. The gender outcome makes sense: unlike most autistic spectrum patients, where males outnumber females four to one, the vast majority of children with Rett syndrome are girls.

LaSalle thinks the mechanism involved is DNA methylation. Layered over

GETTY IMAGES (smoke); ALAMY (rag)

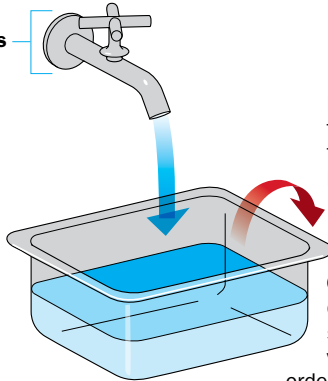
M The more friends you have, the more your brain changes to accommodate your expanding network. | Think you're good at multitasking?

How Environmental Risks Overwhelm the Genome

As the fetal brain is growing, the expression of its genetic blueprint can be influenced by non-genetic factors in the outside world. A pregnant mom's diet and other lifestyle choices, along with her exposure to chemicals and pollutants in food, air, water and household objects, affect the way the fetus's brain develops. These environmental risk factors can be thought of as different streams of water flowing into a sink: only if the sink overflows—that is, if enough negative factors add up—will certain serious disorders result.

Environmental Risk Factors

- ▶ PBDEs (flame retardants)
- ▶ Other persistent organic pollutants
- ▶ Pesticides
- ▶ Not enough dietary folate or other B vitamins
- ▶ Lack of exercise
- ▶ Smoking
- ▶ Stress



Environmental risks add up to fill the sink. If it overflows, a disorder such as Rett syndrome may result.

Genetics
Genetics determines the size of the sink. Inherited vulnerability for certain disorders makes the sink smaller—therefore easier to overflow.

every strand of DNA in all our cells, chemicals called methyl groups influence how our genes are expressed—for instance, turning on genes that build neurons in the brain and turning off those genes elsewhere in the developing body. LaSalle's evidence shows that the brains of people with autism are significantly undermethylated, as were the brains of the rat pups whose mothers had been exposed to levels of PBDEs similar to average human exposure.

If PBDEs are messing with neuronal DNA methylation, that is very worrying. But here is the good news: LaSalle thinks methylation in fetal development works as a kind of “sink”—only if you have *enough* factors going wrong will the sink overflow and normal brain development be affected [see box above]. For instance, if a pregnant woman happens to be vulnerable to Rett because she carries a rare genetic mutation, *and* she has significant exposure to PBDEs, *and* perhaps she does not have enough folic acid or some other detrimental factor, she might end up with a child who has Rett syndrome.

But most of us do not carry the rare mutation in question. Thus, as LaSalle warned an audience at the 2013 annual

conference of the Organization for the Study of Sexual Differences, we should not think of PBDEs as a “smoking gun” for autism. They are one possible environmental influence, played out in a complex relation between genetics and environment at a critical stage of fetal development. Happily, the vast majority of our kids are probably going to be just fine. But to be on the safe side, it is probably worth following these tips to reduce PBDE exposure: dust your shelves more regularly with a wet cloth, clean your floors with a wet mop, and wash your hands before you cook and eat. Keep your body fat in check because persistent organic pollutants tend to accumulate in lipids, and take a walk outside when you can—getting out to exercise does double duty because there is no house dust in the park.

One last thing for expecting mothers: a recent paper from the Centers for Disease Control and Prevention and Duke University indicates that biting your nails and licking your fingers is also correlated with more PBDEs in your blood serum, perhaps because of house dust on your hands. So don't nervously bite your nails, even if you might want to—you know, because of the PBDEs. —Cat Bohannon

CHEMICAL CAVEATS

When you hear about a new finding regarding a risky chemical, consider these often unreported factors

Bisphenol A, phthalates, polychlorinated biphenyls, polybrominated diphenyl ethers—these barely pronounceable chemicals contaminate the bodies of nearly all American pregnant women. Worse, research suggests that most pass through the placenta and into the bloodstream of developing fetuses. But how scared should expectant parents be? Sometimes the way risks are reported makes chemicals sound more dangerous than they really are, and in any case many environmental health risks are surprisingly easy for pregnant women to avoid.

Scientists often estimate the seriousness of a chemical health risk by comparing the magnitude of harm that befalls exposed individuals with that which befalls the unexposed. This calculation typically provides a relative risk estimate—for instance, the 2013 finding that babies born to pregnant women exposed to high levels of pesticides are 30 to 50 percent more likely to develop brain tumors as children. Yet what is often left out of studies and news reports—in part because it can be difficult to estimate—is the baseline risk. Only about one in 20,000 kids is typically diagnosed with a brain tumor, so a mom highly exposed to pesticides has, at most, only a one in 13,333 chance of giving birth to a baby who goes on to develop a brain tumor. A large increase in risk, then, should not always incite a large amount of concern; conversely, a small increase in risk in a common condition could be important.

Expectant parents should not forget the old adage “the dose makes the poison,” either. Children exposed to high levels of the pesticide DDT are more likely to suffer impaired verbal learning and motor development problems, but research findings conflict on how chronic low levels of exposure—which are far more common—affect brain development. “It is often the case that the kinds of doses people get in everyday life are vastly smaller than the kinds that were studied in the original research,” says Brian Zikmund-Fisher,

Continued on next page

Continued from preceding page

a decision psychologist at the University of Michigan Risk Science Center. Moreover, some chemicals pose health problems only beyond a certain threshold of exposure, whereas others might actually be more dangerous at low concentrations than at high ones.

More important, most environmental health studies conducted in people identify associations, not cause-and-effect relations. Certainly the fact that people who have high levels of BPA in their urine are more likely to be obese provides a hint that BPA may cause weight gain. Yet BPA exposure is also associated with other choices, such as processed food consumption, which can cause the numbers on the scale to creep up. Not all chemical associations are causal.

That all said, pregnant women can make smart, simple decisions to protect their unborn babies. Being a nonsmoker is a big one because cigarette smoke interferes with many aspects of development. Eating good food, and preparing it carefully, can make a big difference, too. "Eat low on the food chain, wash your fruits and vegetables before you eat them, and try to eat fresh rather than processed foods—all these things will help because they have the benefit of increasing your nutritional consumption and decreasing your chemical exposures," says Tracey Woodruff, director of the Program on Reproductive Health and the Environment at U.C. San Francisco. These kinds of simple, all-around healthy choices are often much more effective than rash ones such as throwing out all your BPA-lined plastic bottles because it is difficult to eliminate specific risks without introducing new ones. Some packaging manufacturers have stopped using BPA, for instance, but "what they've put in instead is less well tested and often from the same chemical family," Zikmund-Fisher says. "Does it have fewer risks? Who knows?"

Ultimately, Zikmund-Fisher says, we need only look around to realize that there is no need to panic: the vast majority of pregnancies carried to term produce healthy children. "Look at your life and the choices you make, and do things that can make you safer easily, but don't overreact to anything," he explains. "There are very, very few things out there that have such huge effects on our lives or our baby's lives that one teeny bit of exposure is going to make a difference." —Melinda Wenner Moyer



» Prisoner's Escape

Yoga practice reduces anxiety and impulsivity in prison populations

Incarcerated thieves, drug dealers and murderers may not be the typical group you imagine doing yoga, but recent studies show that the ancient discipline might be able to play an important role in reducing prison violence. Several studies have shown that yoga helps to improve symptoms of anxiety and depression in prisoners, and now a study at the University of Oxford has found that it also increases focus and, crucially, decreases impulsivity—a known factor in much prison violence.

The Oxford researchers studied 100 prisoners from seven U.K. prisons. About half the prisoners practiced yoga once a week for 10 weeks; the other half were told they were on a waitlist for the yoga class and encouraged to go about their regular exercise routines. Prisoners in the yoga program—two women and 43 men—became less aggressive toward their fellow inmates and felt less stress, as measured by standard questionnaires. The yogis also performed better than the waitlisted group on a computerized test of executive control, suggesting they had become more attentive to their surroundings and more thoughtful about their actions.

"Attention and impulsivity are very important for this population, which has problems dealing with aggressive impulses," says Oxford psychologist Miguel Farias, one of the study's authors. With less anxiety and aggression, he notes, prisoners should be better able to reintegrate into society when they are released.

—Georgia Pike

Yoga Brain

The ancient practice promotes growth in brain regions for self-awareness

Yoga seems to bestow mental benefits, such as a calmer, more relaxed mind. Now research by Chantal Villemure and Catherine Bushnell of the National Center for Complementary and Alternative Medicine in Bethesda, Md., may explain how. Using MRI scans, Villemure detected more gray matter—brain cells—in certain brain areas in people who regularly practiced yoga, as compared with control subjects. "We found that with more hours of practice per week, certain areas were more enlarged," Villemure says, a finding that hints that yoga was a contributing factor to the brain gains.

Yogis had larger brain volume in the somatosensory cortex, which contains a mental map of our body, the superior parietal cortex, involved in directing attention, and the visual cortex, which Villemure postulates might have been bolstered by visualization techniques. The hippocampus, a region critical to dampening stress, was also enlarged in practitioners, as were the precuneus and the posterior cingulate cortex, areas key to our concept of self. All these brain areas could be engaged by elements of yoga practice, Villemure says. The yogis dedicated on average about 70 percent of their practice to physical postures, about 20 percent to meditation and 10 percent to breath work, typical of most Western yoga routines. Villemure presented the work in November 2013 at the annual meeting of the Society for Neuroscience in San Diego. —Stephani Sutherland

ALAMY

» IN THE BRAIN OF THE BEHOLDER

People find art more beautiful when certain areas of their brain are electrically stimulated

Beauty seems mysterious and subjective. Scientists have long attempted to explain why the same object can strike some individuals as breathtaking and others as repulsive. Now a study finds that applying stimulation to a certain brain area enhances people's aesthetic appreciation of visual images.

First, participants viewed 70 abstract paintings and sketches and 80 representational (realistic) paintings and photographs and rated how much they liked each one. Then they rated a similar set of images after receiving transcranial direct-current stimulation or sham stimulation. Transcranial direct-current stimulation sends small electrical impulses to the brain through electrodes attached to the head. The technique is noninvasive and cannot be felt, so subjects in the trials were not aware when they received real stimulation. The researchers aimed the impulses at the left dorsolateral prefrontal cortex, an area just behind the brow that is known to be a region critical for emotional processing. They found that the stimulation increased participants' appreciation of representational images, according to the study published online in October 2013 in *Social Cognitive and Affective Neuroscience*. The scientists believe the stimulation facilitated a shift from object recognition to aesthetic appraisal for the figurative images; the abstract art was probably being processed by a different area of the brain.

This study is one of many recent successful attempts at subtly altering cognition with noninvasive brain stimulation. Some experiments have found that stimulating certain areas allows people to solve math problems or puzzles that formerly had them stumped. Other work suggests these techniques can enhance motor learning, helping athletes or musicians improve at a new sport or a new instrument more rapidly. Experts are quick to point out, however, that these effects are modest enhancements at best—thought



induction remains firmly in the realm of science fiction.

Still, the researchers behind the new paper are hopeful that the findings could lead to new treatments for mood disorders. "In the case of depression, you lose the pleasure of experiencing life, and you

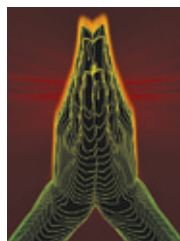
also lose the pleasure you can derive from looking at something beautiful," explains lead author Zaira Cattaneo, a neuroscientist at the University of Milano-Bicocca in Italy. "Maybe we can give back to these patients some pleasant experiences."

—Lila Stanners

» Science as Faith

People may use trust in science as others use religious faith to cope with life's uncertainties

Religion provides a sense of meaning and comfort for believers, and studies show that such beliefs intensify during threatening situations. Now research suggests that some people's faith in science may serve the same role.



Miguel Farias and other researchers at the University of Oxford and Yale University investigated whether it is belief in religion that is beneficial or in fact any belief about the world's order and our place in it. In two related experiments published in November 2013 in the *Journal of Experimental Psychology*, the scientists developed a scale to measure belief in science—the view that scientific inquiry offers a superior guide to reality. As expected, belief in science was inversely correlated with religious beliefs. Next the researchers assessed whether belief in science increased in threatening situations. The first experiment compared a group of rowers at a low-stress training session with a group of rowers just about to compete in a high-stress regatta. The second experiment manipulated some participants' existential anxiety by having them write about their thoughts and feelings regarding their own death. Participants reported greater belief in science in both threatening situations, just as subjects in past studies have displayed an increase in religiosity in similar scenarios.

"It is likely that some people use their ideas about science to make sense of the world and for emotional compensation in difficult situations in the same way that religious people use their supernatural beliefs," Farias says. "Our findings suggest that it may be belief itself, regardless of its content, that helps people deal with adverse situations."

—Tori Rodriguez

STUART BRIERS (woman); GETTY IMAGES (hands)

theory. | Need to muster some gumption? Stimulating a very specific part of the brain with electricity can trigger "the will to persevere."

» Drugs for Down Syndrome

Recent breakthroughs may lead to pharmacological treatments for the chromosomal disorder

People born with Down syndrome have always been considered to be incurably developmentally delayed—until now. In the past few years a number of laboratories have uncovered critical drug targets within disabled chemical pathways in the brain that might be restored with medication. At least two clinical trials are currently studying the effects of such treatments on people with Down syndrome. Now geneticist Roger Reeves of Johns Hopkins University may have stumbled on another drug target—this one with the potential to correct the learning and memory deficits so central to the condition.

Down syndrome occurs in about one in 1,000 births annually worldwide. It arises from an extra copy of chromosome 21 and the overexpression of each of the 300 to 500 genes the chromosome carries. “If you go back even as recently as 2004, researchers didn’t have much of a clue about the mechanisms involved in this developmental disability,” says Michael Harpold, chief scientific officer with the Down Syndrome Research and Treatment Foundation. But all that has changed. “In the past six or seven years there have been several breakthroughs—and ‘breakthroughs’ is not by any means too big a word—in understanding the neurochemistry in Down syndrome,” Reeves says.

This improved knowledge base has led to a series of discoveries with therapeutic promise, including the latest by Reeves. He and his team were attempting to restore the size of the cerebellum in mice engineered to show the hallmarks of Down syndrome. The cerebellum lies at the base of the brain and controls motor functions, motor learning and balance. In people with Down syndrome and in the Down mouse model the cerebellum is about 40 percent smaller than normal. By restoring its size, Reeves hoped to gain a clearer picture of the developmental pro-

cesses that lead to anomalies in a brain with Down syndrome.

Reeves’s team injected newborn Down mice with a chemical that stimulates an important neurodevelopmental pathway that, among other things, orchestrates cerebellum growth.

“We were not in fact surprised that we fixed the cerebellum. That was our working hypothesis,” Reeves says. Yet he had not anticipated that three months after treatment the mice with a restored cerebellum would be able to learn their way around a water maze—a function of learning and memory thought to be controlled by another part of the brain, the hippocampus. The researchers do not yet know whether they inadvertently repaired the hippocampus or whether the cerebellum might be responsible for more learning and memory functions than previously realized.



In fact, other investigational treatments for Down syndrome target the hippocampus—but none target this particular chemical pathway. Reeves’s study, published recently in *Science Translational Medicine*, may point to a pharmaceutical intervention that could allow those with Down syndrome to live more independent lives. “The possibility of actually giving Down syndrome people the ability to improve learning and memory significantly—that’s something I never thought I’d see in my entire career,” he says. “And it’s now happening. The game has changed.” —Jenni Laidman



» MORAL IN THE MORNING

As the day wears on, we become less ethical

Most of us strive to do the right thing when faced with difficult decisions. A new study suggests that our moral compass is more reliable when we face those decisions in the morning rather than later in the day.

In a series of studies at Harvard University and at the University of Utah, 327 men and women participated in tasks designed to measure cheating or lying behavior either in the morning or in the afternoon. For instance, in one study the subjects attempted to solve math problems, some of which were impossible, knowing they would be paid five cents for every solved problem. They reported their own scores, giving them an opportunity to lie and thus receive more money. The people who participated in the afternoon sessions in all the experiments were more likely to cheat than those who took part in the morning sessions.

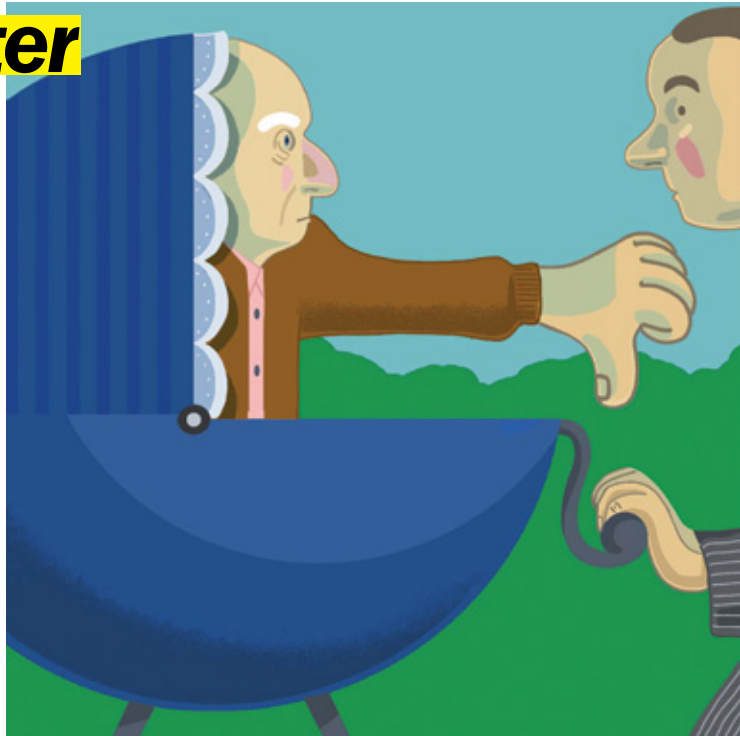
Ethical decisions often require self-control, which past research has found to be dependent on the body’s energy stores, much like a muscle: if it is heavily taxed, it eventually becomes exhausted. This study suggests that even the regular activities of daily life can deplete these resources. It also hints that sleep is crucial for rebuilding moral muscle; indeed, previous research shows that sleep deprivation hampers ethical decision making. So if you are faced with an ethical dilemma, you may want to save your pondering for the morning after a good night’s sleep.

—Nessa Bryce

How to Be a Better

son or daughter

About a year ago I got a new laptop for work and gave my old Macintosh iBook to my mom. She'd been itching for a way to check Facebook and e-mail from the couch and had always wanted a Mac, so she was thrilled. That is, until my ham-fisted lessons on the operating system started up. "No, Mom, you don't need to double-click on hyperlinks anymore..." "Apple-Q is quit, Mom. No, hit Apple and Q at the same time." Eventually she asked my more patient, less irritable husband to be her tech guru because, well, I was being a grouch. That wasn't my finest moment as a daughter, and it made me think: What can I do to be a better, more grateful child to this woman who dedicated so much of her life to me? Here is what sociology and psychology research has to say on the matter:



#1 Have a happy life. Researchers at the University of Texas at Austin asked 600 middle-aged parents to list their children's major life problems, such as job losses or car accidents, and their successes, such as having a happy marriage or family of their own. They found that having multiple successful adult children predicted better well-being for the parents—whereas having just one kid with serious problems dragged down Mom and Dad's emotional health. "Parents are more invested in their adult kids than the reverse; this is something we find in every study we do," says lead author Karen Fingerman. To mitigate the blowback on your parents when something bad does happen to you, try to "recognize that they are empathizing with you and are often concerned, sometimes even more concerned about what's going on in your life than you are. Sometimes you may have to reassure your parents," she says, suggesting adult children can make sure to give their parents positive updates every so often—it's all too easy to call them only to complain.

#2 Accept help. In another study, Fingerman and her colleagues investigated how older parents who give

a lot of help to their grown children affect the happiness of everyone involved. "We started out assuming that it would be a bad thing" for the parents, she says, but the researchers found that helping out grown children financially, emotionally or in practical ways such as with child care, even several times a week, did not generally have an adverse effect on parents' happiness. It may even improve their well-being, Fingerman says, if their help allows their child to live a happier and more successful life.

#3 Don't tell them what to do. One of the biggest mistakes that grown children tend to make is trying to parent their parents, says Howard Gleckman, author of *Caring for Our Parents* (St. Martin's Press, 2009) and resident fellow at the Urban Institute, a social policy research firm in Washington, D.C. As your parents age and get a little shaky cognitively or physically, "some of what you're going to be doing to help them may in fact be the sort of thing a parent would do for a child," he says, such as giving them rides or managing their money. "But if you treat them like a child, it's

going to go very badly for everyone. It's demeaning, and it takes away that independence and respect that they need emotionally." Instead keep in mind that just because a parent is starting to need help in one realm does not mean they cannot be independent in many other areas.

#4 Have patience. Spending so much time reading sociology papers about how parents of grown children feel made me want to go straight to the source and call my mom. When I asked her what the number-one thing my brother, sister and I could do to be better to her she said, without hesitation, "Be patient." It is just plain frustrating, she says, when adult kids lose their cool because a parent is being stubborn, or slow on the uptake, or flummoxed by technology, or is making us wait while they search for their glasses or keys. "A lot of my friends feel this way and say, 'My kids are so mean!' It makes us feel like, 'Gee, we raised you, we were nice to you, we did all this stuff for you, give us a break!'" Well said, Mom. I won't forget it.

—Sunny Sea Gold

Criminals Need Mental Health Care

Psychiatric treatment is far better than imprisonment for reducing recidivism

BY ROBERT BYRON

DESPITE WHAT YOU SEE on television, a verdict of “not guilty by reason of insanity” is exceedingly rare. Most defendants with mental illnesses end up incarcerated—studies reveal that fully half of all prisoners have at least one mental disorder. That is one million people in the U.S. alone, and the prison system does very little to successfully treat them. As a result, the recidivism rate among released convicts is especially high for those with serious disorders.

Forensic hospitals, on the other hand, which hold and treat offenders found not guilty by reason of insanity, have a very high success rate in preventing disordered individuals from returning to crime. In an analysis of data from California, New York and Oregon, Victoria Harris, a forensic psychiatrist at the University of Washington, reported in 2000 that people at these institutions reoffended at a “much lower” rate than untreated mentally ill offenders. Psychiatrist Jeremy Coid and his colleagues at St. Bartholomew’s Hospital in London found in 2007 that forensic patients in the U.K. were 60 percent less likely to reoffend than released inmates and 80 percent less likely to turn to violence.

These and other recent studies show that treatment works, and yet we continue to put offenders with mental disorders in prisons for complex reasons, including our society’s views toward mental illness—especially addiction—and the high cost of psychiatric care for inmates. Still, solutions are within reach. A Connecticut program, for example, allows some veterans who have committed crimes to seek psychiatric treatment instead of serving time. Public knowledge of and support for such programs are essential to breaking the cycle of crime that the current prison system perpetuates.



Prisons as Mental Institutions

The prison system functions in substantial part as the successor to our shuttered mental institutions. In 2009 epidemiologist Jacques Baillargeon of the University of Texas Medical Branch at Galveston and his colleagues rightly described this situation as a “national public health crisis” and found that it arose from a baleful synergism of developments. First, the invention of antipsychotic medi-

cation in the 1960s led to a movement to close the many psychiatric hospitals then extant. These closed institutions were supposed to be replaced by community facilities, but in reality most were not. At the same time, health insurers restricted coverage for mental health treatment, and finally, the “war on drugs,” begun in the 1980s, increased drug-related arrests and brought in mandatory and fixed sentences. More offenders with psychiatric and

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substance abuse problems, often one and the same, were incarcerated for many years without treatment and then released into a community that had nothing for them: no jobs, no treatment, no housing. This led to drifting, homelessness, further mental decline and the chronic reoffending we see today.

In 2012 Jason Schnittker, a sociologist at the University of Pennsylvania, and his colleagues reported that legislatures have criminalized “many common psychiatric disorders,” especially substance abuse—which psychiatry’s diagnostic handbook, the *DSM-5*, categorizes as a true psychiatric disorder. This criminalization of drug addiction means, as Schnittker puts it, that “some inmates end up in prison at least partially because of their psychiatric disorders.”

Most of these mentally ill inmates are not treated for their conditions in prison. And their numbers are rising. Schnittker reports that for the past 40 years, the rate of incarceration has quintupled, from 149 per 100,000 in 1980 to 749 per 100,000 in 2009. As people go in, other people come out. Nationally, 700,000 inmates are released every year, which means, according to the National Institutes of Health, that more than 350,000 disordered offenders return untreated to society. In most accountings, most of these people will reoffend.

Clearly, this system does not work. Strikingly, though, it runs in parallel with a system that does work, namely the system of forensic hospitals, which is where defendants end up who are found not guilty by reason of insanity. This outcome is difficult to achieve: the legal defense must demonstrate that the offender had no control over his or her actions or did not comprehend the present reality of the deed done (for instance, shot at a police officer because he thought the officer had been threatening him on television). A small fraction of 1 percent of all criminal defendants

are acquitted by reason of insanity.

Forensic hospitals confine people as prisons do but achieve radically different results. Both function by way of the criminal justice system, but prisons cause disordered offenders to break the law more—even more than offenders without a disorder—whereas forensic hospitals treat offenders as patients who can and do recover and who return to society as people who can be expected, for the most part, to be law-abiding citizens.

Cured of Criminality

The radical difference in outcomes from these two systems is illustrated by the experience in Connecticut, where I prac-

persons] with borderline personality disorder with frequent suicidal gestures or episodes of self-mutilation.” Others were even worse off, suffering from “acute psychosis, severe depression, suicidal ideation ... and overwhelming anxiety.”

Although the rate of recidivism for the overall cohort of 16,241 inmates was high—67.5 percent within three years—the rate for those with severe disorders was even greater. The department did not indicate by how much, only that it was “significantly” higher.

Given the mental state of these former inmates—people who were *not* found insane during their trials—patients found not guilty by reason of insanity might



Half of all inmates in the U.S. have untreated mental illnesses such as depression or bipolar disorder. When they return to society, they are more likely to reoffend than nondisordered inmates.

tice law. In its 2010 *Annual Recidivism Report*, Connecticut’s Criminal Justice Policy and Planning Division analyzed 16,241 inmates released during 2005. Of these, 1,514 were classified as severely disordered, including people who had “chronic schizophrenia or bipolar disorders with frequent psychotic exacerbations, who need medication and assistance with activities of daily living, [as well as

seem to be especially disordered, and so they can be. Yet after their release, having been confined in mental hospitals, not prisons, not only are they less likely to reoffend than disordered inmates, but they are even less recidivist than offenders without a recognized mental illness. Indeed, in Connecticut they return to crime so seldom that the department of correction does not have a category for them in

(More than 350,000 **disordered offenders** return untreated to society every year.)

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its annual recidivism reports. The agency with jurisdiction over acquittees, the Psychiatric Security Review Board, also does not publish data on persons discharged. In response to my inquiry, however, it reported that between 1985 and 2013, four acquittees were arrested while on temporary leave, and one acquittee was arrested while on conditional release.

Forensic hospitals provide one effective alternative to incarceration for disordered offenders. Mental health courts offer another. Dale E. McNeil, a clinical psychologist at the Langley Porter Psychiatric Institute, part of the University of California, San Francisco, reported in 2007 that 34 states have such courts and that they are effective in reducing recidivism and violent reoffending. Typically these courts provide a separate docket for defendants with disorders, with designated judges and counsel, and they offer defendants the option of entering a nonadversarial process in which they follow a treatment plan in return for reduced sanctions. McNeil's

Although some prisons do have programs such as group therapy sessions that are intended to treat mental disorders, these interventions are largely unsuccessful.

study followed 170 people chosen out of 8,325 defendants with mental disorders for a median of 8.3 months, some of whom went through the mental health courts and some of whom went through traditional legal proceedings. His results showed that mental health court participants went longer without reoffending than those who did not participate. Further, the risk of violent offense was halved. Although the study involved subjects not chosen at random and the defendant pool was limited to San Francisco, McNeil's results align with a consistent trend: for criminals with disorders, treatment works, and it works especially well in reducing the rate of violent offenses.

Should Society Bear the Costs?

We know treatment works. Yet the barriers to treating more mentally ill of-

fenders are huge. For one, treatment is not cheap. In Connecticut, the average annual cost per prison inmate is about \$33,000. The average annual cost per acquittee in a forensic hospital approaches \$500,000. Granted, psychiatrists cost more than prison guards, but I doubt the difference can explain the additional \$467,000; there seems to be more than a little redundancy in the system. Outpatient treatment for insanity acquittees is cheaper, although I could find no specific data on how much less. One advantage for states in classifying an offender as a patient is that he or she becomes eligible for Medicaid reimbursement, which means that the federal government covers half the cost of confinement and treatment. Still, that is a cost ultimately borne by society.

The cost to society of treating mentally ill criminals is hard for some people to swallow. If offenders, disordered or not, are morally responsible for their offenses, why not just keep

them in prison? It is so much cheaper.

I believe the answer to this dilemma becomes apparent if one considers the etiology of mental disorder, which suggests that circumstances and experiences, rather than innate character flaws, give rise to symptoms. The first *DSM* was published in 1952, in large part to organize a universe of disorders created

by offenders who cannot make a legal case for insanity away from prisons and toward treatment, fall into this category. One successful program in Connecticut intervenes on behalf of veterans when they find themselves in criminal court, offering reduced or eliminated sentences in return for closely monitored psychiatric treatment. This policy of inter-

vention speaks to a growing recognition that society is better served by treating mentally ill offenders than by incarcerating them.

powers will, as they did in another era, come to recognize the need people have for productive enterprise and the vital part work has in our individual and national psyches.
Some may debate the connection between disorder and usefulness, but it is beyond contention that the rise in the number of persons incarcerated has

One successful program offers **reduced or eliminated sentences** in return for closely monitored psychiatric treatment.

by war. More than a million soldiers in World War II suffered enough mental symptoms to be deemed unfit for combat. At the time, doctors had no system of describing most of those symptoms.

These symptoms and disorders were caused by conditions and circumstances, not moral defects; the more combat a soldier saw, the more likely he was to suffer symptoms. We can conclude that those who develop disorders, then, whether by circumstances or genetics, are not responsible for their dysfunction. This view is consistent with Schnittker's finding that "childhood adversities have been linked to adult psychiatric disorders" and that such hardships have been linked to subsequent criminal behavior: "childhood disadvantage is associated with both incarceration and adult psychiatric disorders." Treating mentally ill offenders, then, is not just the right thing to do to reduce recidivism, but it is the right thing to do for people whose lot is not of their making.

Early Solutions

Given the difficulty of successfully pleading not guilty by reason of insanity—as well as the inherent problems in mixing disordered inmates, whose disorders tend to make them vulnerable, with nondisordered inmates, who are often predators—early attempts at solving this problem have been workarounds. Mental health courts, which are designed to funnel mentally ill of-

fers who cannot make a legal case for insanity away from prisons and toward treatment, fall into this category. One successful program in Connecticut intervenes on behalf of veterans when they find themselves in criminal court, offering reduced or eliminated sentences in return for closely monitored psychiatric treatment. This policy of inter-

vention speaks to a growing recognition that society is better served by treating mentally ill offenders than by incarcerating them.
We are learning not to hold veterans responsible for how they react to the cauldrons they are thrust into. War, however, is not the only aspect of modern life that can produce disorder. Schnittker notes that in 2006, 7.5 percent of the adult population, or 16 million people, were inmates or ex-inmates, a number that approximates the number of unemployed during the recession of 2008–2009. Indeed, the evisceration of the nation's manufacturing base has coincided closely with the rise in the number of people incarcerated, especially men. Work used to be how many of us redeemed ourselves from early disadvantages. We might hope the reigning

been yoked to the rise of disordered persons incarcerated. People who commit crimes and who are treated, especially in institutional settings, reoffend at rates lower than untreated convicts *and* offenders without disorders—revealing that for most mentally ill offenders, the issue is not moral but psychological. We should recognize that unfortunate conditions produce unfortunate effects. We do not criminalize people who get sick from polluted waters nor those wounded and maimed in wars. We do not call them defective and make of them a pariah class. We treat them, and so should we do with the mentally disordered, however they exhibit that affliction. **M**

ROBERT BYRON is an attorney in Hartford, Conn., with a practice in criminal appeals and psychiatric advocacy.

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The Domino Effect of Greed

Bad behavior gets “paid forward” more than kindness. It need not be that way

BY MICHAEL I. NORTON

EVERY FEW WEEKS a heartwarming tale of regular folks deciding to “pay it forward” makes the news. One driver decides to, say, pay the toll for the next person in line, that person pays for the following driver, and so on. A recent example started on Christmas Eve, when more than 1,000 patrons at a Starbucks in Connecticut agreed, one by one, to pay for the customers behind them. People have engaged in pay-it-forward chains at laundromats, fast food joints and car washes. There’s good reason to think that these random acts of kindness might be common; after all, generosity has been shown to make us not only happier but healthier, too.

Yet any one of us who has experienced the kindness of a stranger also knows that people can just as easily behave as jerks. Perhaps a driver cut you off as you were maneuvering into the toll lane, or someone stepped in front of you to order a caramel macchiato. Unfortunately, research by my collaborators and me suggests that we are more likely to pay greed forward than generosity.

Imagine being in the following situation. I tell you that I gave someone \$6 and instructed that person to decide



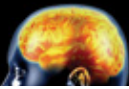
how much or little of it to give to you, keeping the rest for himself or herself. I hand you an envelope that contains the amount they gave you. You eagerly open the envelope, shaking it to reveal your bounty, only to find that this other person has left you nothing. Not a cent. Take a moment to think how you’d feel—and what words come to mind to describe the guy who stiffed you.

Now imagine that I then gave you \$6 and asked you to give as much as you wanted to a new person and keep the

rest. How much would you put in the envelope? With that answer in mind, consider another scenario. What if you had opened the envelope and the previous person had instead been amazingly generous, giving you all \$6? Or what if the person had decided on an even split, giving you \$3 and saving \$3 for themselves—how would that outcome affect your behavior?

My colleagues Kurt Gray of the University of North Carolina at Chapel Hill, Adrian F. Ward of the University of Col-

**MIND
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Each week in **Mind Matters**, www.ScientificAmerican.com/mind-matters, researchers explain their disciplines’ most notable recent findings. **Mind Matters** is edited by Gareth Cook, a Pulitzer Prize-

winning journalist and a regular contributor to NewYorker.com

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orado Boulder and I placed hundreds of people in one of the three scenarios just described—they received either greed, generosity or fairness. The results we gathered were not all heartening. But first I'll share the good news. As we reported in a paper that is forthcoming in 2014, we found that people who were treated fairly were very likely to pay forward fairness. If someone splits \$6 even-

ones. To investigate whether this was the case, we asked a new group of participants to take part in a very similar situation, except instead of splitting money they split a set of tasks that were either enjoyable (making fun word associations) or annoying (circling vowels in dense passages of Italian). An unknown person allotted them either all good tasks, an even split of good and bad

ty. Their results showed that the people who felt a stronger sense of solidarity with the community were more likely to make contributions to the Freecycle network. When users viewed themselves as members of a group of people who help one another, this sense of identity influenced their behavior.

In everyday life, though, many of our interactions are with people with

We should think carefully about how we react when others treat us badly, lest we **become the next link** in a chain of negativity.

ly with me, I'll split \$6 evenly with the next person. People who had received the full \$6, however, did not reciprocate with equal generosity: on average, they were willing to pay forward only \$3. So regardless of whether we have been treated fairly or generously, we tend to respond by behaving merely equitably.

Now the bad news. The people who had received greed were very likely to pay that greed forward, giving the next person just a little over \$1, on average. It seems bad behavior leaves more of an impression on us than good.

Why Pay Anything Forward?

To social scientists, what's most interesting about the phenomenon of paying it forward is that there does not appear to be any good reason to pay anything forward. After all, you have had no prior interactions with the recipient and do not anticipate ever meeting the person. It certainly makes sense to pay people back: if someone gave me \$0 and then I got the chance to split \$6 with that same person, giving him \$0 in return might teach him a lesson to be kinder to me in the future. But visiting the sins of one person on an unsuspecting new individual—as participants did in our research—seems less sensible and less fair.

We had a hunch that people are more likely to pay greed forward because negative emotions tend to exert more influence over us than positive

ones, or only the onerous deeds. Immediately after receiving their assigned tasks, we gave our participants a survey that assessed their emotional state. Then they were given the opportunity to assign another set of tasks to the next person, along the same lines.

Our results revealed that people pay greed forward as a means of dealing with the negative emotions that being treated badly engender. If I can't pay you back for being a jerk, my only option for feeling better is to be a jerk to someone else.

This isn't to say that people don't pay forward good deeds. As the Starbucks example illustrates, people are capable of generating remarkable chains of kindness, under certain conditions. One such condition is a feeling of "groupiness." Sociologist Robb Willer of Stanford University and his colleagues Francis J. Flynn and Sonya Zak conducted research on Freecycle, a Web site where people post items—from cheap goods such as office supplies to big-ticket objects, including cars—they wish to either give away or obtain. The key feature of Freecycle is that all items must be given with no compensation and no reciprocity. You can't make money, and you can't give in order to receive. The researchers surveyed 805 Freecycle participants on their use of the service. The respondents also answered several questions that assessed how intensely they identified with the Freecycle communi-

whom we share no group affiliation. In these cases, unfortunately, we should expect to see more greed paid forward than generosity. As a result, we should think carefully about how we choose to react when others treat us badly, lest we become the next link in a perpetual chain of negativity. Luckily, our research offers a way out. We found that having people focus on something positive, such as funny cartoons, can alleviate a greed-induced bad mood and encourage them to end greed chains.

So the next time someone cuts you off in traffic, try blasting a favorite song and singing along. It just might encourage you to be the generous soul who stops the spread of greed. **M**

MICHAEL I. NORTON is an associate professor of business administration at the Harvard Business School and co-author of *Happy Money: The Science of Smarter Spending* (Simon & Schuster, 2013).

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How a desire to stand

U N I

out from the crowd



shapes behavior and

E L Y

creative thinking

By Hans-Peter Erb and Susanne Gebert
Photoillustration by C. J. Burton

Who am I?

The question seems so simple, yet it cuts to the heart of everything we do. Without an answer, we lack the inner compass that guides us through life. Decisions become arbitrary. Relationships dangle by a tenuous thread.

Introspection offers partial insight into this nebulous yet vital question. A fuller account, however,



FAST FACTS

BALANCING "I" AND "WE"

- 1 Researchers call the human drive to emphasize individuality the need for uniqueness.
- 2 A high need for uniqueness is characteristic of extroverted, open people.
- 3 In daily life we try, often unconsciously, to balance our sense of "I" with our sense of "we."

emerges from our interactions with the social environment. As we move through the world, certain people, ideas and activities resonate more than others. This mix of allegiances is ultimately what makes you *you*.

A defining force in the shaping of identity is a person's drive to be different and special. Psychologists define this facet of personality as the need for uniqueness. Their research has revealed that every one of us seeks uniqueness to some degree. Those who have little need for uniqueness tend to find comfort in familiarity. Others strive to be extreme outliers. Most of us fall somewhere in between.

Even for the most exotic among us, the need for uniqueness is counterbalanced by a desire to fit in. Consider, for example, the hypothetical case of a Fortune 500 businesswoman with a thoroughly pierced face and a Mohawk. Most likely she feels very much at home around others with a similar look. In a corporate boardroom, however, she probably feels ill at ease. The reason is context: in the first case, she surrounds herself with like-minded people, a group to which she feels she belongs. Because these two social circles—those who embrace a punk aesthetic and those who sit in boardrooms—rarely overlap, we almost never encounter such edgy executives. Herein lie the yin and yang of uniqueness: somewhat paradoxically, we set ourselves apart by affiliating with groups of people more like us. Uniqueness emerges from the distinct combination of alliances that only you seek out.

The natural drive to be unique has broad effects. It informs purchasing decisions. It affects appearance, for example, through hairstyles and tattoos. And it is an important driver of innovation. Many major discoveries emerged from the minds of scientific outsiders. Think of Albert Einstein, the patent office clerk who chafed under the strictures of academia but thrived once he could pursue his interests in autonomy. Or consider Marie Curie, the first woman to achieve numerous accomplishments in science, culminating in two Nobel Prizes. Had she conformed to the social expectations for her gender, the world would have been deprived of her many contributions. In short, uniqueness enhances creativity. So let your true self shine through—the world might thank you for it.

Fitting in vs. Sticking Out

The idea of a need for uniqueness has a long history in psychology, originating with the study of its counterpart, conformity. Psychologist Solomon Asch attained renown in the 1950s for demonstrat-

ing that a person's views are vulnerable to the opinions of the majority. In his now classic experiment, a participant sat in a room with several other people, all of whom had been secretly hired by Asch and his colleagues. The task was to look at a line and then pick which one of three other lines most closely resembled the initial prompt. Given the way the task was designed, identifying the proper line ought to have been exceedingly simple.

But the experimenters set up the situation so that the actors they had hired all responded before the real participant, and they all gave the same wrong answer. When the participants' turn came around, about a third responded just as the actors did—an astounding fraction, given that the correct choice was crystal clear. Later, when they were asked why they gave the wrong answer, the subjects recalled the uncertainty they had felt at the time. Although they had initially arrived at the proper response, they began to doubt themselves and concluded that the group was probably right.

Variations on Asch's initial study revealed that factors such as the size of the group, the presence of a dissenter or two, and the group's overall status could alter how many participants ultimately go against the grain. Nevertheless, as Asch concluded, "that we have found the tendency to conformity in our society so strong that reasonably intelligent and well-meaning young people are willing to call white black is a matter of concern. It raises questions about our ways of education and the values that guide our conduct."

The matter of why and when people strike out on their own captured the interest of two other psychologists, Howard L. Fromkin, then at York University in Ontario, and his colleague Charles R. Snyder, then at the University of Kansas. In the 1970s they developed a theory that everyone craves uniqueness to some extent. They discovered that relatively simple questions can gauge the intensity of this need in a person, and so they devised a uniqueness scale. In it, respondents rate how strongly certain statements apply to them, such as "I tend to express my opinions openly, regardless of what others say," "I like to go my own way," and "I always try to live according to the rules and standards of society."

Using Fromkin and Snyder's scale, one of us (Erb) and his colleagues looked at how the need for uniqueness mapped to the "big five" personality traits, the basic human characteristics recognized by most psychologists. (The five traits are extroversion, openness to experience, neuroticism, agreeableness and conscientiousness.) In a survey

of approximately 150 students, we found that three of these traits are closely connected with the need for uniqueness. Individuals with a strong need for uniqueness tend on average to be extroverted. They are sociable and optimistic about life. They also tend to be open to new experiences. In addition, a pronounced need for uniqueness is associated with low neuroticism; such people generally are more satisfied with their life and have fewer mood fluctuations.

Despite their convivial nature, people who are

Individuals with a higher than average need for uniqueness and openness to experience tend to engage in creative activities more frequently than their mainstream counterparts.

high in their need for uniqueness also tend to care less about others' opinions, and they typically engage in creative activities more frequently than their mainstream counterparts. [For more on creativity, personal challenges and the need for uniqueness, see "From Contretemps to Creativity," by Scott Barry Kaufman, on the next page.] The other two dimensions of the big five, agreeableness and conscientiousness, do not appear to be linked with either a strong or weak need for uniqueness.

Manipulating Uniqueness

Although a person's propensity to seek uniqueness is generally stable throughout life, certain situations can shift it temporarily. In a 2009 study conducted by psychologist Roland Imhoff, now at the University of Cologne in Germany, in collaboration with Erb, we wanted to investigate how making someone feel average might affect his or her subsequent behavior. To do so, we asked our subjects to fill out a personality test. We then gave them bogus feedback—half the participants were told they had very pronounced individual traits, at the same time

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the other half learned that their personality was simply normal.

Next we asked them how they felt about a debate regarding dining cars on trains. To test whether the personality test results altered their desire to stand out in the crowd, we showed them a chart that claimed that either 79 or 21 percent of respondents believed that dining cars should be dropped from German Federal Railway trains.

As we discovered, the subjects who had been told they were average were much more likely to opt for the minority opinion. In contrast, those who had been told they had notably unique traits tended

to agree with the majority. We interpreted this as meaning that the people who had been led to believe they were unremarkable had felt that their individuality was threatened and thus offered a dissenting opinion as a way to differentiate themselves. People will express their individuality even in something as mundane as a debate on German dining cars.

The realization that the desire to both fit in and stick out can drive decision making has not been lost on retailers and product designers. People who wish to be seen as tough, for example, are more likely to sport a leather jacket. To come across as shrewd in business, a person might acquire a cus-

FROM CONTRETEMPS TO CREATIVITY

FOR SOME PEOPLE,
HARDSHIP CAN
TRIGGER CREATIVE
GROWTH

By Scott Barry Kaufman

"I paint in order not to cry," artist Paul Klee once remarked. The artist suffered from an autoimmune disease, which crippled his hands and made it difficult for him to even hold a pen. Yet he painted obsessively. His turmoil seemed to release an outpouring of creative energy.

Systematic research has shown that many eminent creators—think of Frida Kahlo, the Brontë sisters or Stephen Hawking—endured harsh early life experiences, such as social rejection, parental loss or disability. A growing field of research, called post-traumatic growth, now seeks to unveil why adversity and ingenuity sometimes go hand in hand and why some people blossom more than others in the wake of trying times.

In a study published in 2013, psychologist Marie Forgeard of the University of Pennsylvania tackled these questions by asking a sample of adult partici-

pants to recall the single most stressful event they had experienced during their life. Most participants described a traumatic occurrence that happened either to them or to a loved one, such as going through a natural disaster, an accident, physical or sexual assault, illness or the loss of a loved one. Participants also completed measures of their involvement in creative endeavors.

The subjects tended to report that their most traumatic experiences motivated them to engage in creative behavior in a wide range of domains, including the arts and business, as well as within their relationships. This heightened motivation to pursue creative activities—also called creative growth—predicted a more general tendency to perceive new opportunities in life after the stressful circumstances. Commenting on these results, Forgeard noted that "going through adversity may enable individuals to see the world, and their role in it, in a different way."

Yet not everyone can wring lemonade out of life's lemons. Forgeard observed that people who are high in one particular personality trait, "openness to experience," are more likely to report creative growth following trauma. Those who have this trait enjoy exploring their rich inner landscape of emotions, ideas, daydreams and fantasies. They also often possess two other attributes: they tend to be more unconventional

than others and to have a higher need for uniqueness. In other words, individuals who are open to experiences are more likely to find themselves in unconventional and challenging situations and to construct meaning out of them—even when these experiences are not chosen but imposed, as with adverse circumstances.

Sharon Kim, an assistant professor at the business school of Johns Hopkins University, and her colleagues probed one aspect of this correlation in a 2012 study. They examined whether a need for uniqueness might fuel creativity in the wake of social rejection, a kind of adverse event. After assessing their participants' need for uniqueness, the researchers told some of their subjects that they were not selected to be in a certain group, and therefore they had to complete a set of tasks alone. The remaining individuals were told that they would join their group after finishing those same tasks.

Everyone then worked through a test of creative thinking that involved seeing an uncommon connection between words. For example, they might be asked to find the word connecting "fish," "mine" and "rush."* The researchers found that participants who experienced social rejection during the experiment performed better on the creativity test than those who felt included in the group. Consistent with Forgeard's findings,

tom-tailored suit. These behaviors may seem commonsense, but the underlying motivation is to signal an individual's inner self to the outer world.

To understand how this need motivates consumer behavior, consider a study published in 2012 by graduate student Cindy Chan of the Wharton School of the University of Pennsylvania and her colleagues. They examined how purchasing decisions reflect a person's attempts to juggle identifying with a social group and maintaining individuality.

Chan and her co-workers suspected that consumers satisfy their competing motives on different dimensions of a given product. To test this idea, the

researchers recruited college students who belonged to one of their university's eating clubs. Similar to fraternities, the eating clubs differ in their social identities, with one club attracting athletes, another drawing science and engineering students, and so on. The researchers took pictures of participants from three clubs and blurred the images so only the clothing remained visible. The students also filled out a questionnaire to measure their need for uniqueness.

Then a group of students drawn from those same three clubs viewed the photographs and guessed the subject's club. They also rated the

those who were already high in a need for uniqueness displayed the largest improvements.

The real question, of course, is why adverse events—whether in the form of social exclusion or a personal tragedy—can induce creative behaviors. According to a theory by psychologist Ronnie Janoff-Bulman of the University of Mas-

sachusetts Amherst, trauma shatters prior assumptions about the world and oneself. Thus, an adverse life event might not be strictly necessary to prompt creative growth. Maybe any experience that shakes up our prior beliefs will do the trick.

Psychologist Simone Ritter of Radboud University Nijmegen in the Nether-

lands and her colleagues explored this possibility in a study published in 2012. The team had some of the participants enter a virtual-reality world that violated the laws of physics. For instance, as people walked toward a suitcase lying on a table, the size of the suitcase decreased, and as they walked away, its size increased. Trippy! A second group merely watched a movie of those unexpected occurrences.

The researchers found that those who experienced the weird events in virtual reality displayed greater flexibility on a test of creative cognition than those who merely watched the film. They hypothesize that any unusual and unexpected event—whether it is the death of a parent or a semester abroad—can facilitate cognitive flexibility.

This is good news for anyone who wishes to increase his or her creativity without having to experience trauma. Flip the script of your ordinary routine. Butter your toast with your hands. Smile at everyone who passes by. Moonwalk on your way to school. With your brain snapped out of its ordinary awareness, you will be in a better frame of mind to create.

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**The answer is "gold."*



These dancers from the Philippines might appear outlandish, but they are in fact signaling group membership by participating in a local festival to honor birds.



uniqueness of that person's look as compared with others in his or her club.

As it turned out, the observers were good at their jobs. They were highly accurate when identifying a subject's club from his or her clothing in the photographs. They likewise guessed correctly which students had higher or lower needs for uniqueness. The finding suggests two things: that our taste in clothing broadcasts our identity to the people around us and that we can signal group

membership and uniqueness simultaneously through choices of clothing.

But these results do not yet tell us *how* a person's choices can accomplish these two goals. Thus, in a set of follow-up experiments, Chan and her collaborators manipulated whether a participant felt like he or she was an insider or an outsider. They did so by asking their subjects to write about a group that they either did or did not feel a part of, such as an athletic team, a fraternity or a student council. As before, they also measured their participants' need for uniqueness.

Then they examined the participants' purchasing preferences. Similar to the setup of the German dining car experiment, these researchers showed subjects a set of products, revealed the preference of the group they had described, and asked them what they would choose. But the decision scenarios were multidimensional. For example, participants might choose not only between a BMW and a Mercedes but also between colors or models of the respective brands.

Those who had been made to feel like outsiders did not reveal any preferences. After all, they were not motivated to try to either join or reject the social group they had been thinking about. The participants who felt like insiders, however, were significantly more likely to select the brand that their group had opted for. They successfully com-

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municated their membership in that social circle.

But the insiders who ranked higher in the need for uniqueness did not follow the majority all the way. The desire to separate oneself from the herd exerted its influence not in the brand but at the level of the product, through the choice of a model or color. People do not simply assimilate or differentiate—they can do both simultaneously along different dimensions of a decision.

A Matter of Culture

Not only do individuals differ from one another in their need for uniqueness, entire cultures do as well. The most striking, well-supported divide between the cultures of the world is that of individualism versus collectivism. Individualist cultures emphasize personal freedom and reward achievements that make a person stand out. The U.S., the U.K. and the Netherlands are prime examples.

Collectivism emphasizes community cohesiveness. These cultures—think Pakistan, Nigeria and Peru, as well as many countries in Asia—encourage members to strive toward shared goals. In a collectivist society, uniqueness has negative connotations, akin to deviance, whereas conformity is linked with harmony. It is a small step to translate these differing cultural priorities into divergent needs for uniqueness. In a study that compared the need for uniqueness of Malaysians and Americans, for example, researchers found considerably lower scores among the former.

In one 1999 experiment that explored the effects of cultural attitudes toward uniqueness, psychologists Heejung Kim, now at the University of California, Santa Barbara, and Hazel Rose Markus of Stanford University, recruited Americans and East Asians from the waiting areas at San Francisco International Airport. To disguise the true purpose of the study, the participants were asked fill out a short survey in exchange for a free pen. On completion, the experimenter reached into a bag and pulled out five green or orange pens such that one or two of the pens were always a different color from the rest. Which color a person selected was the real test. As it turned out, Americans opted for the more rare choice. They chose a pen of the minority color three times out of four, whereas only one in four East Asians chose the less common color.

Given the pronounced effect they saw, Kim and Markus wondered whether advertisers emphasize cultural themes in their efforts to entice buyers. In a survey of almost 300 advertisements, they found that Korean ads were twice as likely to highlight conformity than uniqueness, and American adver-

tisers more commonly underscored how a product makes someone stand out.

If a need for uniqueness is linked with creativity, then a culture's orientation toward individualism could enhance that society's overall innovativeness. At the same time, the every-man-for-himself mentality that accompanies individualism could undercut a culture's ability to capitalize on its inventive thinking. Aligning a team's members toward a common goal—an easy task in a collectivist group—might be significantly harder to achieve.

Contemporary Western society can sometimes seem to take uniqueness to its logical extreme—people pursue personal goals, advance individual interests and strive for independence from others.

To investigate this question, economists Yuriy Gorodnichenko and Gérard Roland of U.C. Berkeley compared data across countries and found strong positive correlations between a country's individualism and its measures of innovation. They also noted in their study, published in 2010, that increasing individualism enhanced a country's standard of living considerably. Thus, an increase in individualism of one standard deviation—say, from Venezuela to Greece or Brazil to Luxembourg—was linked with a 60 to 87 percent increase in income. This trend suggests that, one way or another, countries of independent thinkers find a way to rally others to bring their ideas to life.

Contemporary Western society can sometimes seem to take uniqueness to its logical extreme: people pursue personal goals, advance individual careers and strive for independence from others. Yet it is important to remember that humans evolved as a group-living species. Over the course of evolution human adaptations have been such that a person is unlikely to survive without the aid of others. Shared resources, mutual protection and division of labor are all major advantages of belonging to a group.

It is clear that two opposing forces are at work in shaping a person's identity—a need for uniqueness and a desire to assimilate. For any one of us, the identity we settle on satisfies both constraints. But keep this in mind as you go through the rest of your day: it is only by standing out that a person can be outstanding. **M**

THINKING ABOUT TOMORROW

Getting to know
yourself—and
your future self—
can put you on
a path toward
contentment

By John D. Mayer





I once asked participants in a study which of several “big questions” about personality they found most interesting. The first-place winner was, “What is my future?” This question is a productive one: people who wonder about their future exhibit an especially healthy form of curiosity, one that augurs greater well-being over time.

In the late 1990s psychologists Philip G. Zimbardo and John N. Boyd, both then at Stanford University, studied the degree to which people focus on their past, present or future. People who live in the present, as opposed to speculating about their future, may enjoy the spontaneity and freedom that such in-the-moment styles allow, and many do quite well living that way. But those who are most present-oriented are also somewhat more likely than others to engage in risky behaviors such as abusing drugs. By comparison, those of us who focus more on what lies ahead often shape our lives in ways that make good sense for our future.

Planning ahead would not be so interesting, I think, except that many of us really identify with our future selves. By “identifying,” I mean that we care for the individual we will become and lay the groundwork to make those later versions of us as comfortable and successful as possible.

To plan about our future selves, we use a mental ability I call “personal intelligence.” Personal intelligence is the capacity to identify, and reason about, information about personality. We use this ability to recognize information about people from their appearance, possessions and behaviors and then use that to

label our impression of a person and to match that impression to our knowledge of similar people. From such clues, we deduce how to behave with the person and how that person will treat us in return. And we look for clues about our own selves to better understand our needs and to map out our future plans. Our ability to reason this way serves as an inner guidance system that helps us navigate the people and situations we encounter and to attain our goals, be it to find a pleasing lunch mate or to choose a more inspiring direction for our life.

People with higher personal intelligence may construct more vivid, detailed future selves than others. These elaborate constructions encourage them to identify more with their future, to take on the stewardship of their present life and guide themselves to attain their goals. Imagining a future self that is realistic, rather than fantastic, is similarly more likely to lead to contentment, as is aiming for outcomes that are consistent with one another and with one’s own values.

Adapted from *Personal Intelligence: The Power of Personality and How It Shapes Our Lives*, by John D. Mayer, by arrangement with Farrar, Straus and Giroux, LLC. Copyright © 2014 by John D. Mayer. All rights reserved.

THOMAS BARWICK Getty Images

Life's Dream

In 2009 psychologist Hal Ersner-Hershfield, then at Stanford, and his colleagues developed a simple method to record our sense of connection to the later versions of who we are. Participants were shown a continuum of seven pairs of circles. Each pair included one circle labeled “current self” and the other, “future self.” On this seven-point scale, the first pair of current and future circles did not overlap at all, indicating that a person saw little relationship between who he was at present and the person he might become. Each pair overlapped a bit more until the final, seventh pair of selves, which decisively overlapped. Participants selected a pair to indicate how connected they were to their later selves.

Among the people in the study—community members from the San Francisco Bay Area—those who most identified with their future selves planned their life with longer-term payoffs in mind: they saved more money and as a consequence had amassed more wealth than others. Ersner-Hershfield, who is now at New York University, concluded that envisioning our future selves and feeling connected to who we will become guide our behaviors in the here and now in ways that will create longer-term rewards in economic and other realms of our life.

In theory, we can create as many future versions of ourselves as we like, limited only by our imagination. But the more fanciful, whimsical or wishful visions of ourselves, though useful for brainstorming, may be unhelpful if we lack the personal intelligence to identify which selves are plausible. To be reasonable, our imagined selves ought to join together our personality of today with our likely circumstances over time and the person we can realistically hope to grow into.

Psychologist E. Tory Higgins of Columbia University



has explored the relationships among several of our most common self-images: he asks participants to list qualities of their actual selves, of the ideal selves they would like to become, as well as their “ought” selves—the selves other people think they should be. Participants whose actual selves were quite different from their ought selves—signaling that they were failing to meet others’ expectations—experienced more agitation and fear and perceived more threats to themselves. Participants whose actual selves were distant from their ideal were more prone to disappointment and sadness. Although it is not pleasant to be in those negative states, they can serve as a heads-up signal—alerting us to get closer to our goals or to meet others’ expectations.

Our ideal selves are often part of a broader life’s dream, according to psychologist Daniel Levinson and his team, then at Yale University. From the 1960s to the 1980s, they followed 40 men from four occupational groups: blue- and white-collar workers in industry, business executives, academic biologists and novelists. The team conducted multiple interviews with each man and studied the biographies of additional public figures as well. A number of the men pursued a dream that crystallized their motives moving forward. Levinson and his colleagues observed: “This Dream is usually ar-

FAST FACTS

FINESSING YOUR FUTURE

- 1 Personal intelligence is the capacity to draw out, and reason about, information about personality. We use it to deduce how to behave with others, how others will behave toward us, to better understand our own needs and to map out our future plans.
- 2 Two people with different sets of values will use their personal intelligence in different ways and to different ends.
- 3 Some people are better than others at choosing aims that are consistent with one another and thereby avoiding contradictory pursuits.

includes dozens of questions along the lines of “How much are you like a man who believes being creative is important to him?” or “How much are you like a woman who wants people to do what she says?” Each question was designed to reflect a specific value. Schwartz and his colleagues believe that respondents for whom “being creative is important” valued self-directed, independent thinking; respondents who chose “wants people to do what she says” more generally sought opportunities for personal power. The team identified 19 internationally recognized values, including self-directed thinking and pursuit of personal power. They arranged the values in a circle with four compass points.

Feeling connected to who we will become guides our behavior in ways that will create longer-term rewards.

At the north is a universalistic orientation, which includes tolerance (“He works to promote tolerance and peace”) and self-directed thought. To the east are hedonism (“Enjoying life’s pleasures is important to him”) and personal achievement in the eyes of others (“She wants people to admire her accomplishments”). Moving southeast, one can find dominance (“She wants people to do what she says”). To the south is a belief in the importance of

articulated within an occupational context—for example, becoming a great novelist, winning the Nobel Prize (a common Dream of our biologists), contributing in some way to human welfare, and so on.”

Looking over the men’s development over the decades, Levinson and his colleagues viewed the dream as a directional force that could be ignored only at peril to the person’s development and that would resurface if not attended to. As they put it, “Major shifts in life direction at subsequent ages are often occasioned by a . . . sense of betrayal or compromise of the Dream. That is, very often in the crises that occur at age 30, 40, or later a major issue is the reactivation of a guiding Dream . . . that goes back to adolescence or the early 20’s, and the concern with its failure.”

Inner Compass

We must weigh multiple values in choosing a direction. Two people with different sets of values will use their personal intelligence in different ways and to different effects. And as observers using our personal intelligence, we familiarize ourselves with the range of values people use to guide their life because knowing a person’s values helps to explain why they make the choices they do. We cannot understand someone who values his family highly if we focus only on his work performance.

Psychologist Shalom H. Schwartz of the Hebrew University of Jerusalem worked with an international team of researchers to examine the values that people hold around the world, by administering a survey that

security and safety (“Having order and stability in society is important to her”), and to the west are humility and caring (“He tries always to be responsive to the needs of his family and friends”). Moreover, each of us does better if we know which way our inner compass points. Then, we can apply our personal intelligence to make sure we are proceeding in tune with what we most care about.

The values we emphasize may lead us to excel in one area of life and fall short in another. People with a high level of personal intelligence are likely better at recognizing such compromises—and understanding the trade-offs they prefer for themselves [see box on next page]. Psychologists Ravenna M. Helson of the University of California, Berkeley, and Sanjay Srivastava, now at the University of Oregon, studied women who varied in the values they pursued over their life. They divided the women into four groups: seekers, conservers, achievers and “depleteds.” The seekers wanted personal growth and to think for themselves (they would be toward the north of Schwartz’s compass). The conservers valued tradition, family, security and hard work (the southwest of the compass). The achievers wanted both personal growth and the ability to excel at what they did (covering an area along Schwartz’s compass from the north

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Having the skill to set goals that go together well is a plus: people with nonconflicting aims experience greater overall well-being.

goal setting than others—they are better able to choose aims that are consistent with one another and to avoid contradictory pursuits as much as possible. Sometimes our strivings are related to one another, as with a young professional who wants to get promoted at work and move to a bigger apartment in a safer area. At other times, they may be more independent but can still be carried out with little conflict, such as a person who wants to meet new people through present friends and to accept others as they are.

But some of us are prone to set goals that conflict with one another, such as the study participant who hoped both “to appear more intelligent than I am” and “to always present myself in an honest light” or another participant who wanted both “to keep my relationships on a 50–50 basis” and “to dominate, control, and manipulate people and situations.” Having the skill to set goals that go together well is a net plus: people with nonconflicting aims experience less inner turmoil and greater overall well-being. Participants also had greater well-being if they perceived that their plans were autonomous rather than being imposed from the outside by parents, teachers or supervisors.

Clayton Christensen, a professor at Harvard Business School, points out that many of his Harvard classmates attend reunions “unhappy, divorced and alienated from their children,” and yet he doubted that any of them had set goals to achieve those outcomes. What happened, as he saw it, was that they lost sight of their life purpose and failed to prioritize their relationships. (Some people may commit a mirror image of this error: they may become so focused on their immediate needs to be with their family and friends that they fail to achieve sufficiently in their careers to support themselves and others, yielding economic insecurities later on). Christensen’s implication



is, plainly, to keep the long-term goals and purposes in mind and to be content with devoting some time to those projects, even if the payoff is not immediate, advice that corresponds well to the idea of identifying with one’s future selves. **M**

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HONEST LIARS

HOW THE BRAIN LEADS US TO BELIEVE FALSE TRUTHS

BY MARIA-DOROTHEA HEIDLER

ILLUSTRATION BY BRIAN STAUFFER

On a Monday morning at a home for the elderly in Cologne, Germany, a nurse asked 73-year-old Mr. K. about his weekend. “Oh, my wife and I flew to Hungary, and we had a wonderful time!” he replied. The nurse paused—Mr. K.’s wife had passed away five years ago, and he had not left the home in months. Was he trying to impress her? More likely, Mr. K. was confabulating, a phenomenon in which people describe and even act on false notions they believe to be true.

For confabulators, even physical evidence proving them wrong is not enough to unseat their inaccurate beliefs. Neuropsychologist Morris Moscovitch of the University of Toronto coined the term “honest lying” to describe this condition. Confabulations can consist of wildly untrue statements—claims of being abducted by aliens—but also can consist of

memories from long ago, as was the case with Mr. K. They are often autobiographical. Patients easily toggle between rational thought and their false beliefs, unable to differentiate between the two.

Confabulation is a common phenomenon that can stem from numerous dysfunctions in brain mechanisms. Mr. K., for example, suffered from Alzheimer’s

disease. Another common cause is Korsakoff's syndrome, a form of amnesia sometimes seen in chronic alcoholics. Other triggers include aneurysms or brain trauma that damages regions associated with memory or sensory perception. Yet even healthy people engage in a mild form of confabulation. In an effort to maintain a coherent narrative, we sometimes explain away unusual phenomena without ever becoming conscious of our own fibbing.

In recent years several compelling theories have emerged to explain aspects of confabulation, although a complete picture remains elusive. One overarching theme is that no single brain net-

RESEARCH ON CONFABULATION HAS PRODUCED INSIGHTS INTO ONE OF THE MOST FUNDAMENTAL QUESTIONS ABOUT THE BRAIN: **HOW IT IS THAT WE CONSTRUCT OUR PERSONAL SENSE OF WHAT IS REAL—AND WHAT IS NOT.**

work or region is responsible for this form of dishonesty. Rather numerous brain dysfunctions can manifest in this one way. In my 20 years of work as a speech therapist at a neurological rehabilitation clinic, I find that many of my patients confabulate. Although currently our understanding is too incomplete to offer hope for treatment, research on confabulation has produced insights into one of the most fundamental questions about the brain: how it is that we construct our personal sense of what is real—and what is not.

Making Memories

Confabulators such as Mr. K. construct false memories out of the fragments of genuine recollections. So to understand how past moments can breed fictions, we need to understand the basics of memory.

Memories of the past serve one core function: to inform and guide future behavior. When we retrieve a memory, the recollection becomes temporarily unstable as its constituent pieces are reassembled into a conscious thought. While it is taking shape, however, the memory is open to tinkering. Indeed, research has shown that memories can be heavily influenced by the present and thus easily distorted.

FAST FACTS

FRACTURED REALITY

- 1 Confabulations are false claims that a teller deeply believes to be true.
- 2 They are a symptom of many brain diseases and types of damage that affect memory and sensory perception, but they can also occur in a mild form in healthy people.
- 3 In pathological cases, the cause often involves damage to the ventromedial prefrontal cortex, an area that likely helps us to distinguish between the present and memories of the past.

This seeming flaw is also what permits us to recombine bits of the past to imagine new scenarios. “We have this imperfect system for representing the past in the service of a much stronger system for imagining the future,” says neuropsychologist Asaf Gilboa, who researches confabulation at the University of Haifa in Israel. In a 2010 study, Gilboa and his team summed up confabulation as a confluence of problems related to memory retrieval.

To efficiently call up memories, the mind relies on schemas, which are complex sets of associations among familiar situations, places and information. According to Gilboa, many confabulating patients have difficulty distinguishing between schemas. These mental scaffolds allow us to recall clusters of past events and information rather than becoming lost in irrelevant details. When trying to remember a recent visit to the doctor's office, for example, we can retrieve a schema of the office and then sift through our experiences there to find the correct memory.

In a recent test of this idea, Gilboa and his colleagues examined confabulators with damage to the ventromedial prefrontal cortex (VMPFC), an area just above the eyes associated with decision making and the regulation of emotions. (Clinicians had already noticed that injury to this area can give rise to honest lying.) The researchers asked the confabulators as well as healthy participants to imagine their bedtime routine. They then showed them a series of words and asked whether the words were relevant to bedtime. The participants then repeated the task, this time after imagining a visit to a doctor's office.

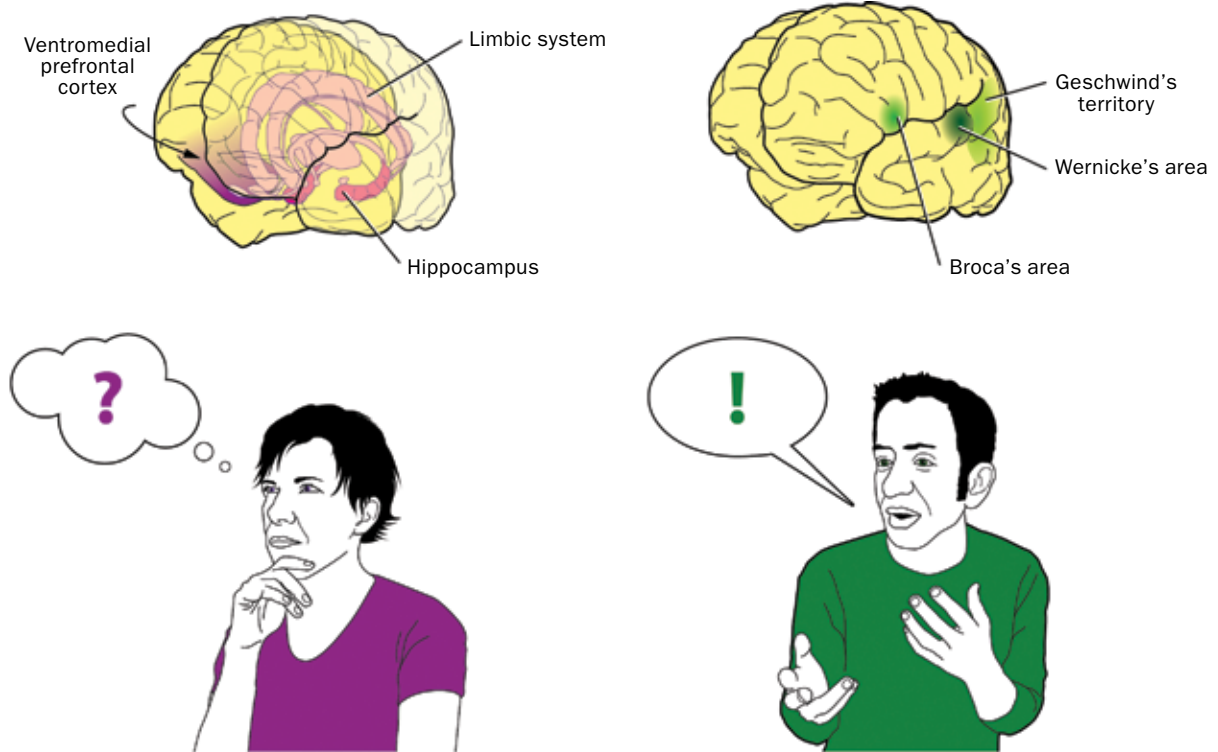
The researchers wanted to know whether the confabulators and healthy subjects differed in how well they could distinguish between the two scenarios. So they asked the subjects to rate how relevant a word used in the bedtime condition was to the doctor visit. Confabulators answered correctly only 60 percent of the time, whereas healthy individuals were right 95 percent of the time. The finding, which is not yet published, suggests that the VMPFC plays a role in helping us decide which memories are relevant to a given situation.

Of course, no one brain area works in isolation, and the VMPFC is no different. It communicates closely with parts of the limbic system, a collection of structures deep in the middle of the brain that play a leading role in our emotional life and our ability to form memories. Neurologist Armin Schnider, who has been studying confabulation at the University of Geneva, suggests this brain network serves as a reality-control mechanism that helps people distinguish between reality and fantasy as well as the past and the present.

In one 1999 study that sought to bolster the theory, Schnider and his colleague Radek Ptak compared confabulating patients, individuals with amnesia and healthy people as they viewed a succession of images. Most pictures appeared only once, but some of them turned up a second time. During several rounds of testing, subjects were asked to focus on a target image; for example, in the first round they might be instructed to look for

A Deceptive Brain

Different kinds of brain dysfunction appear to trigger confabulation. Two proposed explanations are illustrated here. At the left, damage to the ventromedial prefrontal cortex or a communication disruption between it and the brain's primary memory structures, located in the limbic system, can lead to confusion and the perception of a false reality. At the right, disturbances in the language systems of the brain can also lead to honest lying. According to this model, confabulation arises from a disconnect between the brain's main language areas, shown in green, and structures in the opposite brain hemisphere that integrate thoughts and stimuli into a coherent model of the world.



photographs of airplanes, but in the second round they were to focus only on baby carriages. Participants were expected to press a button whenever they recognized the target image.

The amnesia patients and the healthy participants had no trouble with this exercise. Confabulators, however, were unable to distinguish between the rounds. The more the experiment was repeated, the more frequently confabulators identified earlier target images. Brain scans revealed that these participants showed lesions in, among other places, the VMPFC. This area was intact in the amnesic patients, whose brain damage was limited to other areas. Schnider suggests that the capacity for memory—embedded in the limbic system—had to co-evolve with a mechanism for checking whether a memory matches reality. Without such a mechanism, he adds, “Memory would be dangerous.” To further explore this idea, Schnider hopes to examine whether these structures are underdeveloped in an immature brain, which might help explain young children’s ability to move easily between reality and fantasy.

Although Gilboa’s and Schnider’s explanations sound simi-

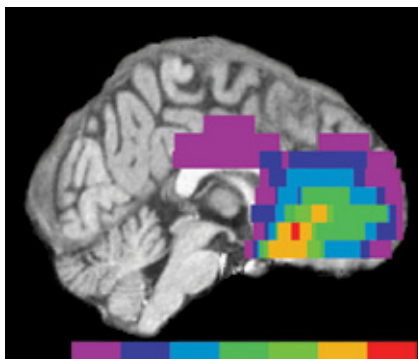
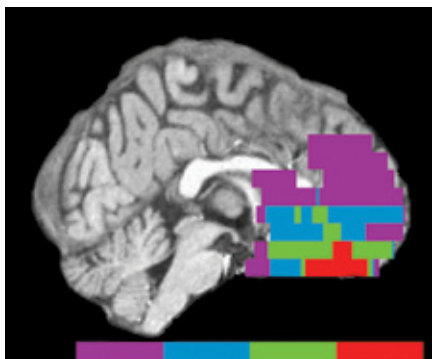
lar, the neural machinery of each is likely to be distinct. In a 2011 study, Schnider found that monitoring a memory for its precise content—Gilboa’s theory—produced significantly different brain activity than judging whether a memory relates to the present reality. Ultimately several brain malfunctions might independently trigger confabulation.

Everyday Invention

Indeed, people need not have suffered brain damage to unintentionally invent stories. Healthy individuals also occasionally confabulate when called on to explain a choice. Psycholo-

THE AUTHOR

MARIA-DOROTHEA HEIDLER is a speech-language pathologist at the Brandenburg Clinic, a neurological rehabilitation facility in Bernau bei Berlin and a researcher at the University of Potsdam in Germany. She encounters confabulation regularly in her work. Some of her patients tell bizarre stories, including one man who told her that he had built an earthwork dam in Tokyo the week before.



To identify the causes of confabulation, Asaf Gilboa and his team at the University of Haifa scanned the brains of patients who had suffered damage from a similar kind of aneurysm. Some of them confabulated, but others did not. The scientists then overlapped the scans, with confabulators shown at the left and the truth-tellers at the right. Pink indicates that one person had a lesion in that area, and red indicates that all of them did. In the confabulators' brains, the red area covers the ventromedial prefrontal cortex.

gist Petter Johansson and his colleagues at the University of Lund in Sweden demonstrated this phenomenon in a study published in 2005. The researchers showed 120 male and female subjects photographs of young women and asked them to choose which they found most attractive. The participants were then asked to explain their selections. Unbeknownst to the study participants, the investigators had secretly switched the pictures at this point, so that the subjects were in fact offering justifications for a different picture. Only about a third of participants noticed the switch. The rest dreamed up completely plausible explanations. Johansson calls this phenomenon “choice blindness.”

The mechanisms underlying this phenomenon remain largely mysterious, but work by neuroscientist Michael S. Gazzaniga of the University of California, Santa Barbara, suggests that these kinds of confabulations arise from the language centers in the left hemisphere of the brain, especially Broca's area in the frontal lobe, Wernicke's area in the temporal lobe, and Geschwind's territory in the parietal lobe. Studies from numerous research groups show that these regions produce a constant stream of verbal explanations for our behavior based on the information collected and processed in other parts of the brain. Gazzaniga concludes that there is a “human tendency to generate explanations for events.”

Disruptions in the brain's language circuits can also give rise to pathological confabulation, independent of the brain's memory circuits. This observation dates back to research from 1965 by the pioneering neurologist Norman Geschwind. In the

cases he considered, a brain lesion or other abnormality interrupted communication between the left hemisphere's language areas and the right hemisphere's association areas, which integrate stimuli into a coherent model of the environment. In an attempt to weave a consistent narrative, the left hemisphere will fabricate explanations.

American neurobiologist Roger W. Sperry documented this effect in his famous experiments in the 1960s on so-called split-brain patients, who had suffered from intense epileptic seizures. In an attempt to quell these patients' seizures, neurosurgeons had severed the main bridge connecting the brain's right and left hemispheres, called the corpus callosum.

On a special projector, Sperry showed a comical picture to the left eye of test subjects, which is governed by the right hemisphere; the left hemisphere perceived nothing. Several of the test subjects laughed, but they were unable to explain why they found the picture funny. They nonetheless attempted to explain away their laughter—for example, by claiming that they found the projector amusing.

In some cases, such as when patients with disruptions in their language-related circuits also endure damage in the prefrontal cortex (perhaps including the VMPFC, as mentioned earlier), confabulators may produce fairly grotesque explanations. As one of my patients once told me, “I can't move my right arm at the moment because the doctor put it in the refrigerator.”

Bringing all these brain findings together, we can surmise that there are two basic systems in our brain: a creative mechanism in the language areas of the left hemisphere, which produces explanations for our experiences and memories, and a control circuit in the VMPFC and limbic system, which tests the plausibility of these concoctions. This dynamic between creativity and control is an important component of our thought processes. Both mechanisms occur unconsciously and usually remain in equilibrium. In confabulating patients, however, the brain's supervisory circuits have gone haywire. They are no longer able to rein in their fantasies.

Even when these fantasies are completely unrealistic and illusory, patients nonetheless believe them. This phenomenon reminds us how deeply anchored is our need for coherence, causality and stability—even among those who have severe brain damage. **M**

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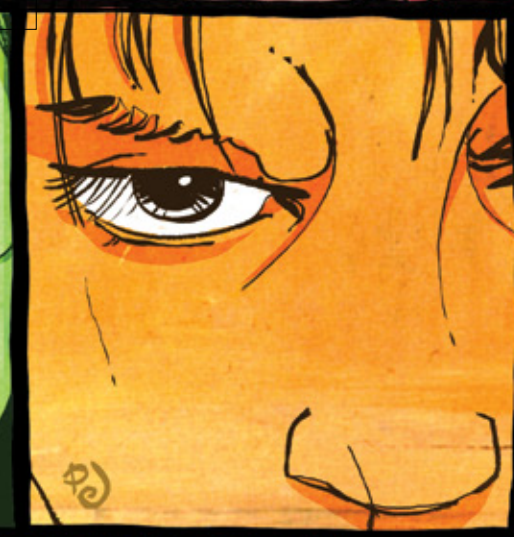


SPECIAL SECTION


Calming a Child's Mind

A healthy child is not only physically fit but also mentally well. In this special section, we describe cutting-edge therapies for three of the most common psychological problems in children: severe anxiety, disruptive behavior and attention-deficit hyperactivity disorder.

ILLUSTRATION BY PJ LOUGHRAN







When I first met Julia, she was the most anxious, depressed child I had ever seen. Twelve years old, she had stopped going to school and seldom left her apartment. Her eyes were big with fright. When she spoke, it was in a very soft, crackly whisper, and she would stammer, as if struggling to find words.

Julia was terrified that anyone who might see her would know instantly that something was wrong with her. When she did build up the courage

to venture out, she would open the door and peek out; if she saw a neighbor in the hallway, she would close the door and wait until the coast

was clear. She was not able to see friends or go anywhere comfortably, and her confinement made her feel hopeless.

Julia suffered from social anxiety, a fear that stems from being evaluated, judged and found wanting by others—and by oneself. About 1.8 million children in the U.S. suffer from clinically serious anxiety, according to the Centers for Disease Control and Prevention, with the type of anxiety tied to a child's developmental level. Separation anxiety is the most prevalent in preschool or early grade school, for example, when children typically learn to separate from attachment figures. Social anxiety tends to show up around puberty, when children become more tuned-in to others around them.

Talk therapy, even with an experienced, dynamic clinician, was not working for Julia. She and her therapist had discussed how hard life was for her, but she was not learning *why* or how to make it better. In fact, talk therapy can be counterproductive for children such as Julia. Her therapist had told her to stay out of school until they could get to the bottom of her anxiety, but the longer a child is out of

Fear Not, Child

Children with anxiety disorders can wallop their worries—and get back their life—by being encouraged to do just what they fear most. One doctor details how he helps his young patients

By Jerry Bubrick

ILLUSTRATIONS BY PJ LOUGHRAN

EDITORS' NOTE: All patient names in this article are pseudonyms.

her social world, the harder it is for her to go back.

The best path for Julia, as I saw it, diverged dramatically from the one her previous therapist had taken. Rather than exploring the anxiety's roots, I discuss its effects. Instead of letting fears guide behavior, I change the behavior to get rid of the fear. I practice what is called cognitive-behavior therapy (CBT) with children, and the data show that it works. In an intensive version of the therapy, I use two-hour sessions daily, or almost daily, until a patient is stable. I told Julia's parents that if they stuck with the program I was confident we could show their daughter how to regain control of her life.

Unlearning Anxiety

Traditional psychotherapists view anxiety disorders as a function of unresolved issues in childhood, such as unsuccessful toilet training or disturbing sexual urges. Therapy is a process of trying to identify and resolve those past problems, which are often buried in the subconscious. Cognitive-behavior therapists, on the other hand, believe that anxiety is caused partly by genes and partly by learned patterns of thought and behavior.

CBT is geared toward unlearning those negative habits. It is based on the hypothesis that how we think and act both affect how we feel. By changing thinking that is distorted or dysfunctional, we can positively affect our emotional state. Moreover, if we recognize that some behaviors generate and reinforce feelings that

harm us, we can lessen those emotions by changing those behaviors.

The cognitive component of CBT dates back to the 1950s, when a clinical psychologist named Albert Ellis, frustrated by the ineffectiveness of psychoanalysis, developed something he called rational emotive behavior therapy: active, goal-oriented treatment in which the therapist engages patients in



At age 12, Julia rarely left her apartment. When she did muster the courage to go out, she first peeked out from behind the door to make sure the coast was clear.

identifying, challenging and replacing self-defeating thoughts and beliefs, which he called “crooked thinking.” In the 1960s psychiatrist Aaron Beck of the University of Pennsylvania had also become disillusioned by psychoanalysis. Focusing on his patients’ negative views, he developed what he called cognitive therapy as a way of helping them reframe such notions. The roots of the behavior-modification part of CBT emerged in the early decades of the 1900s and beyond, when pioneers in behaviorism such as Ivan Pavlov, John Watson and B. F. Skinner experimented with conditioning—linking actions to environmental stimuli—and using positive and negative reinforcement to alter behavior. The cognitive and behavioral approaches were merged in the late 1970s.

FAST FACTS

CONQUERING DREAD

- 1 About 1.8 million children in the U.S. suffer from clinically disabling anxiety.
- 2 Cognitive-behavior therapy helps people alter dysfunctional thoughts and change behaviors that reinforce harmful feelings.
- 3 In exposure and response prevention, a therapist helps a child face fears so he or she can habituate to them rather than avoiding or escaping them.

Research over more than 20 years has shown definitively that CBT is the most effective treatment for reducing symptoms of severe anxiety. In a meta-analysis (statistical review) of 48 controlled studies of CBT for anxiety in children published in 2012, clinical psychologist Shirley Reynolds of the University of East Anglia in England and her colleagues determined that this form of therapy works for anxiety in kids, too, particularly if it is tailored to the type of fear the child experienced. Other researchers have shown how CBT affects the brain. In 1996 psychiatrist Jeffrey M. Schwartz of the University of California, Los Angeles, and his colleagues reported that a course of eight to 12 weeks of CBT, delivered about two hours a week, was associated with specific metabolic changes within a brain circuit thought to be involved in anxiety disorders, suggesting that the therapy is resolving symptoms by altering the function of this circuit.

Unfortunately, many of the children who could benefit from CBT do not receive it. This problem stems in part from a lack of experienced clinicians. In addition, many pediatricians, school psychologists and others are unaware of the benefits of the therapy and so fail to refer children. Meanwhile some doctors and therapists mistakenly believe that the therapy is too tough on children when, in fact, the treatment is very gentle. We work at a child's pace, supply emotional support, and ask youngsters to do only what they are ready to do.

Hierarchy of Fears

For children with anxiety disorders, the process begins by helping them, and their parents, distance themselves from the anxiety by having them conceptualize it as a bully in the brain. We encourage children to give the bully a name and talk back to it. Kids have called their nemesis the Witch, Mr. Bossy, Chucky, the Joker and, in the case of teenagers, names I cannot repeat. We explain that we are going to teach skills to handle the bully, giving children the idea that they can control their anxiety rather than letting it control them.

Another part of the process involves mapping out how the anxiety is affecting a child's life. In Julia's case, her anxiety, and desire to avoid it, was cutting her off from everything she enjoyed in her life, mak-

ing her depressed. I drew a flowchart that looked something like this:

ANXIETY > ANTICIPATORY ANXIETY > AVOIDANCE > DEPRESSION

As a sixth grader, Julia had hung out with friends, gone to restaurants, played the violin and walked in the park. Now she did none of those things. A year ago she counted seven kids as her good friends; now she was down to one she saw very rarely. She was not sleeping. Julia's depression was a result of her anticipatory anxiety, a free-floating form of anxiety that someone feels when anticipating going into a situation she thinks will cause debilitating fear. If she went out in public, someone might see her, and she might be so overcome with anxiety that she would have a full-blown panic attack, in which people experience physical symptoms they misinterpret as a heart attack and worry they may be dying. (The ac-

WE ENCOURAGE kids to give the bully a name and talk back to it. Kids have called their nemesis the Witch, Mr. Bossy, Chucky, the Joker and, in the case of teenagers, names I cannot repeat.

tual symptoms are not dangerous, however.) So she avoided going out. And the avoidance only heightened and reinforced her social anxiety. Once I sketched out that chain of events, Julia got it, and I had her buying in, a little bit, to the idea that this therapy was going to be different. Her buy-in was important because the next step—facing down her fears—would depend on her trusting me.

The core behavioral technique in the treatment of anxiety is exposure and response prevention. Adopting poet Robert Frost's claim that "the only way around is through," this method slowly and systematically helps a child face her fears, so she can habituate to them rather than avoiding or escaping them by continually seeking reassurance or engaging in ritualistic behaviors such as hand washing.



Wearing a wig in public can constitute treatment for anxiety. Exposing children to their worst fears—whether of heights or looking foolish—helps to diminish their dread.

The first step is to identify triggers. We design a “hierarchy of fears,” a series of incremental challenges, each of which is tolerable, that together build to significant progress. Instead of thinking in black-and-white terms—I *can’t* touch a dog, or I *can’t* cross a bridge—kids are coaxed to consider degrees of difficulty. We might ask a child with contamination fears, for example, “On a scale of 1 to 10, how difficult would it be to touch the door handle with one finger? To touch and open the door?” For a child with a fear of vomiting, we might ask: “How difficult would it be to write the word ‘vomit?’” If that challenge is a 3, to say “I will vomit today” might be a 5. To see a cartoon of someone vomiting might rate a 7. To watch a real video of someone vomiting

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might be considered a 9. At the top of the hierarchy most likely would be eating something the child thinks will make him vomit. By rating these different fears, kids come to see that some are less extreme than they had thought.

Next, we expose the child to the stressor in its mildest possible form and support him or her until the anxiety subsides. Fear, as with any sensation, diminishes over time, and children gain a sense of mastery as they feel the anxiety wane. In Julia’s case, we invited a colleague she had not met to my office to have a conversation. Julia was to ask my colleague a set series of questions. Afterward, Julia and I asked our visitor how she had done. “Did she make eye contact? Did she seem anxious to you?” Hearing, and handling, this feedback was the second part of the exposure because the

feedback touched the core of her anxiety, which related to how others perceived her. Once she was comfortable interviewing a stranger in a controlled environment, we asked her to go into the hallway and approach someone and have a conversation. Again, she asked specific questions—“I’m taking a poll. What’s your favorite restaurant?”—and we asked for feedback from those she polled.

To more powerfully trigger her fear of embarrassment, we asked her to be deliberately annoying by asking someone the same question repeatedly. Then, to purposely draw negative attention in a different way, we introduced a ridiculous wig. First I wore the wig, while Julia, with me, asked questions of others around the halls. Then she wore the wig and even brought some more silly wigs from home. Eventually we took coffee orders around the office and went to Starbucks, wearing the wigs.

“Blah, Blah, I’m Not Listening”

Social anxiety does not always manifest as shyness or social inhibition. It is also behind a lot of disruptive behavior that is often misinterpreted as will-

ful aggression. One patient of mine, a 10-year-old boy named James, found himself in the emergency room after an incident that started when another boy asked him an embarrassing question. The boy said he had heard that James wanted to see a picture of one of their classmates in a bikini. James denied it, got agitated and shoved the boy. An altercation ensued; James turned into a Tasmanian devil, destroying papers and throwing things. He ended up in the vice principal's office, where he kicked the vice principal to try to get away. School officials called 911, so James could get a psychiatric evaluation.

It was not the first time James had snapped. Everyone saw him as a bully—angry, aggressive and out of control. He was banned from the cafeteria, so his parents had to take him home for lunch every day. His parents had tried therapist after therapist. Nothing was working.

We found that James was off the charts for social anxiety. He could not accept any—even constructive—criticism. He avoided even the possibility of negative feedback, which he found humiliating. When his parents asked him how his day was, he literally covered his ears and said, “Blah, blah, I’m not listening.” So when the boy came to him and said, “Hey, I heard you want to see so and so in a bikini,” even if the claim was *true*, James was so embarrassed that he freaked out.

For a child such as James or Julia, whose functioning was severely impaired, the treatment should at first involve multiple hours every day for a week or several weeks and only later consist of the typical weekly sessions. Such intensive treatment jump-starts positive change and builds a child's confidence that things *can* get better, motivating him or her to work hard. In addition, evidence suggests that the most change occurs between sessions, when patients apply the skills they have learned. When sessions are close together, kids complete the homework more consistently, resulting in faster acquisition of skills. In-

JAMES WALKED a pet banana on a leash on the sidewalk. Then we went to Grand Central Station and assigned him to ask strangers, “Where is Grand Central Station?” or “Is this the place to get trains?”

tensive outpatient treatment also enables families who do not have ready access to a qualified clinician to travel to one.

We treated James daily for two weeks until he was much more functional, and then he returned weekly 10 times. In addition to wearing wigs, James walked a pet banana on a leash on the sidewalk. At one point we went to Grand Central Station and assigned him to ask strangers, “Where is Grand Central Station?” or “Is this the place to get trains?” Since his treatment, he has not missed a day of school or earned a detention. He is back to eating lunch in the cafeteria, too.

Multiple studies during the past six years back

One boy with contamination fears used hand sanitizer 50 times a day, asking his mother to wash the bottle after each use.





up our experience that daily CBT for several weeks can reduce anxiety by at least as much as having months of weekly sessions. In a study published in 2007 psychologist Eric Storch of the University of South Florida and his colleagues found that three quarters of 20 children and adolescents shed symptoms of obsessive-compulsive disorder (OCD)—in which individuals attempt to control fears or unwanted thoughts with compulsive or ritualized actions—after 14 sessions of family-based intensive (daily) CBT. In contrast, just half of 20 youths who had received the same number of weekly treatments went into remission. In a second trial published in 2010 Storch and his colleagues found that 14 sessions of intensive CBT led to a significant reduction in OCD symptoms as well as associated depression and behavioral problems in 24 of 30 youths for whom medication had not worked well. Sixteen of the kids went into remission.

“Is There Something Wrong with Your Legs?”

Parents also play an important role in exposure therapy. Not only do they urge their children to do their homework but they also must learn to stop doing things that enable the anxiety to grow. With the

Michael once even considered his siblings unsanitary. But after he was taught to sit with his anxiety until it passed, his worry waned, enabling him to eat with his family again.

best of intentions, parents often let children avoid what they fear, sometimes even banishing words, sounds or objects that trigger a child’s anxiety. Instead of making such accommodations, I advise parents to encourage a child to face her fears. For example, if Julia said, “I can’t go get the mail,” instead of saying, “That’s okay, I’ll get it,” her parents were taught to challenge her. “Is there something wrong with your legs?” they might jokingly ask. If Julia really could not get the mail, her mom and dad learned to find something she *could* do, such as just opening the door or going part of the way.

In the case of Michael, an 11-year-old with severe OCD and a fear of contamination, his mother opened doors for him so he would not have to touch the doorknob. She put his laundry in the hamper so he could avoid touching dirty clothes. Among the things he saw as contaminated were his brother and sister. So if Michael’s mom was carrying food to him and his sister walked in front of her, she threw away the food. Michael had not eaten at the table with his family for 15 months.

We explained to Michael’s mother that going to such great lengths to protect Michael from his anxiety was actually reinforcing it. “Before I knew what accommodation was, I thought I was helping,” she told me. “I was devastated to know I was feeding the OCD instead.” Once I identified the accommodations Michael’s mom was making, I worked with her to gradually remove them as soon as I felt Michael was ready. So instead of trying to help Michael feel safe when he was, say, anxious about touching the doorknob, she encouraged him to sit with the anxiety, knowing it would pass, and he would be able to open the door himself.

Some evidence supports the importance of parents in the process. In one study published in 2006 child psychologist Jeffrey J. Wood of U.C.L.A. and his colleagues assigned youth with anxiety disorders who were six to 13 years old to either family-focused CBT, in which parents were taught more effective

communication strategies in conjunction with children's treatment, or CBT with minimal involvement from parents. The children who received the family therapy showed a 79 percent reduction in anxiety symptoms compared with a 53 percent improvement in those who had been in the therapy without parent participation.

Many anxious children can also benefit from medication, especially antidepressants, either alone or in combination with CBT. Unless a child is too impaired for CBT or the family is unwilling to do the work involved, we recommend therapy alone for the first few months to better evaluate its efficacy and then add medication when necessary. The combination of CBT and medicine has been shown to be the most effective approach for moderate to severe cases of anxiety.

On Top of the World

For the first three weeks, I saw Julia three to five times a week for two hours each time. I wanted to boost her confidence and get her back out into the world. Once she was feeling more energized and the depression was fading, I gave her homework. I assigned her to go for a 10-minute walk in the park; she did not have to talk to anyone, just be outside. Then I told her to go to a restaurant to pick up a menu. One restaurant became three—later, five. Next, she had to go to Macy's and buy something. Eventually we worked on seeing friends. At first, friends visited her apartment. Later, I assigned her to go out with friends to restaurants and movies as a reintroduction to being social in the city. Our approach was the exact opposite of the one espoused by her previous therapist: stay inside until they unearthed the roots of her anxiety.

After six weeks of intensive therapy, Julia was feeling—and acting—close to her old self again, and we switched to weekly sessions. She had not returned to school, however, because she felt the environment was too demanding and critical. Julia's parents found a new school for her.

During the summer, Julia went on a family trip to Europe, armed with an action plan for her anxiety and a lifeline to us. "You can always text or call me," I told her. But I did not hear from her. When she came back, she was much happier and more con-

WE EXPLAINED to Michael's mother that going to such great lengths to protect Michael from his anxiety was actually reinforcing it. "Before I knew what accommodation was, I thought I was helping," his mother said.

fidant than she had been before she left. By fall, Julia was ready for her new school. Within a few weeks there, she had started to make friends—and soon she had many. She joined the track team and got into the musical a cappella group.

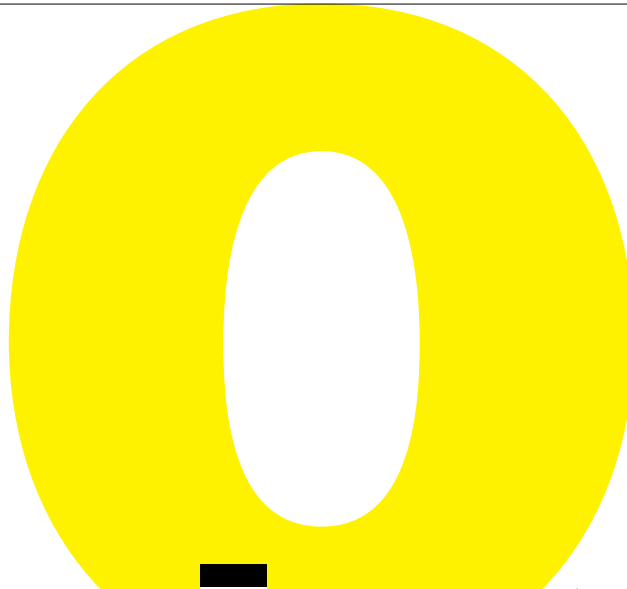
One day she returned to her old school to see her friends perform in a talent show. The lead singer of one of her friends' groups was sick, and the other members asked Julia, on the spur of the moment, to sing in her place. In front of the entire school, Julia sang an Adele song. She came out of that performance on top of the world, and the experience crystallized for her how much better her life has become after shedding her ever present apprehension. "Time goes by so much faster," she says, "when you're not constantly dreading things." **M**

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Behave!

An interactive parent-training program can stamp out behavior problems in kids—and abuse from parents

By Ingrid Wickelgren

ILLUSTRATIONS BY PJ LOUGHRAN

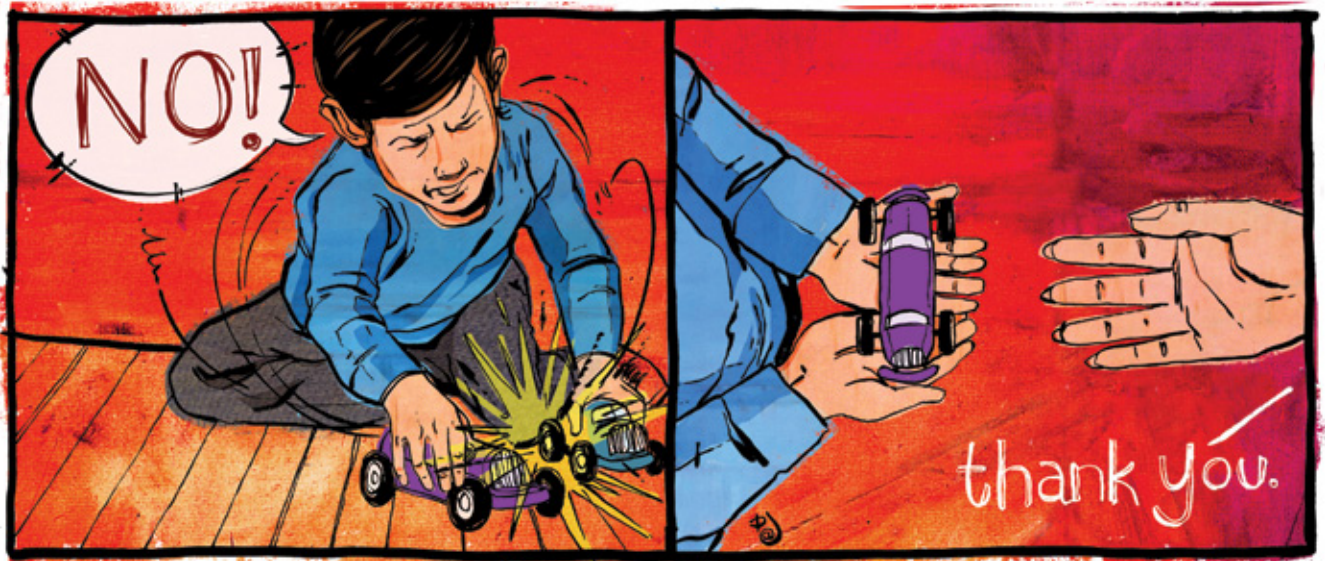
On a Thursday in early August, psychologist Steven Kurtz is preparing one of his clients, Maria, for a therapy session. A calm, cheerful woman with long, dark hair, Maria has been in training at the Child Mind Institute in New York City with her six-year-old son, Ryan (not his real name), for months to ready him for this day. Her goal seems simple: to coax Ryan to obey a simple command. But Ryan does not take direction well.

Maria and Ryan are undertaking a brand of parent training called Parent-Child Interaction Therapy (PCIT) designed to correct oppositional behavior in children. Until now, Maria has let Ryan pick their activities. Today, for the first time, Maria will choose something to do.

One command at a time, Kurtz tells Maria. She practices: “Can you give me the blue piece?” The psychologist corrects her: “Give me the blue piece.” Commands must be direct, to avoid any implication of a choice. Praise immediately if he obeys, Kurtz advises; when he does not, say: “If you don’t hand me the blue piece, you have to sit







To reduce disruptive behavior, parents are advised to ignore minor acts of defiance. But Mom or Dad should praise the child as soon as he or she does something good.

in the time-out chair.” If he gets off the chair, Mom’s line is: “You got off the chair before I said you could. If you get off the chair again, you will have to go to the time-out room.”

“Like the Lord’s Prayer, the words are always the same.” Kurtz explains. “Spoken with the same intonation.”

Kurtz removes the bins for storing toys now in the room; they are more likely to be used as weapons than for cleanup, he reasons. Another issue is Ryan. He is at a computer downstairs and feels like staying there. When Maria drags the thin, dark-haired boy into the room, he is scowling. “This is boring!” he shouts.

Kurtz explains the new rules to Ryan. “Until now, you’ve been choosing the activities.” Today, Kurtz says, “Mom is going to take turns with you.”

“Hey—I have this car. I have this car!” the boy interrupts. He is holding one of the toy cars in the room. Kurtz continues: “When Mom chooses the activity, it’s very important that you follow her directions. If you don’t, she is going to tell you to go in this chair. If you stay in this chair, you get to go back and play with her again. If you don’t, you have to

go in this room.” He gestures toward the door of a narrow enclosure in one corner of the room. “No, I will stay in here!” Ryan yells.

Kurtz exits and sets up shop in a small observation room behind a wall of one-way glass. Kurtz can watch the pair, but they cannot see him. Maria will listen to his directions through an earbud she is wearing.

Maria tells Ryan that their special time is beginning. “Would you like to pick an activity?” she asks. Ryan is throwing toys around the room. “Hold off on all instructions until later,” Kurtz advises. “What is he doing?” The therapy calls for narrating a child’s actions, to show interest and help focus a child’s attention on a task. “Right now he’s playing with the cars,” Maria says.

Cars are flying around the room. Bang! Crash! Bang! Maria does not scold, shout or even look at Ryan. She stares straight ahead. “Look for that split second he does something you like,” Kurtz advises. “When he stops throwing ... for a second ...”

FAST FACTS

FAMILY MATTERS

- 1 A brand of parent training called Parent-Child Interaction Therapy (PCIT) can correct oppositional behavior in children two to seven years old.
- 2 Little kids with significant behavior problems are at high risk of serious antisocial behavior later on.
- 3 Because of its scientific backing, PCIT is gaining international recognition and making headway in states where large-scale training programs are in effect.
- 4 The approach has stopped parents in the child welfare system from continuing to abuse their children.

Most young children willfully disobey or throw tantrums from time to time. Yet when every routine task—fastening a seatbelt, holding hands at the corner, getting dressed—ignites a confrontation, parents often seek help. Designed for kids who are two to seven years old, PCIT changes the way parents respond to their children. It strengthens the bond between parent and child while providing consistent rules and incentives for cooperation.

Rather than treating a disorder, PCIT is aimed more broadly at disruptive behavior, which can range from talking back to severe aggression. The most common mental health concern for young children, disruptive behavior is a feature of several different diagnoses, including oppositional defiant disorder (ODD)—extreme disobedience and hostility toward authority figures—and conduct disorder, in which kids flaunt rules, fight, lie, steal and engage in other alarmingly bad behavior.

Ryan has attention-deficit hyperactivity disorder (ADHD), which often spurs conduct problems. He is not so much driven to defiance as he is inexorably drawn to whatever is most alluring at the moment—a television show, hot chocolate, a playground, even sleep. His need to pursue his current activity causes him to refuse conflicting requests or demands. Every morning Maria had forcibly pulled Ryan out of bed and dressed him. When Ryan's grandmother had taken care of him after school and turned off the TV, Ryan angrily threw all the available books and toys onto the floor.

More than 100 research articles, including eight randomized trials, have demonstrated that PCIT is highly effective in ameliorating such reactions, and the gains are lasting. The stakes go beyond family dynamics. Little kids with significant behavior problems are at

MOST YOUNG children willfully disobey from time to time. Yet when every routine task—fastening a seat belt, holding hands at the corner, getting dressed—ignites a confrontation, parents often seek help.

high risk of serious antisocial behavior later on. “Previous research is very clear: if early child behavior problems are not corrected, they are likely to escalate to behaviors that are more destructive and intractable,” says Jennifer Wyatt Kaminski, a developmental psychologist at the Centers for Disease Control and Prevention. “Preventing risky and violent behavior in adolescents is an important public health issue.”

Because of its scientific backing, PCIT is gaining international recognition and making rapid headway into clinics in pockets of the country—principally, Delaware, California, the Carolinas, Pennsylvania, Oklahoma and Iowa—where large-scale training programs are in effect. The therapy most likely will become more widely disseminated when PCIT International, an organization established in 2009, rolls out its planned protocol for certifying therapists. Certification will make it possible for interested parents to find qualified therapists on the Internet.

Recent adaptations have retrofitted the approach to suit older children, and—taking advantage of its emphasis on parenting skills—to prevent relapse

in abusive parents. PCIT offers useful tactics, too, for controlling more moderate forms of troublesome behavior in children. “It is a way to change your vocabulary and speak to your kids in a positive manner,” says Joshua Masse, a clinical psychologist at Delaware’s Division of Prevention and Behavioral Health Services. Kurtz adds, “This is the manual that parents should be given.”

“Your Imagination Flies Like Your Robot”

PCIT got its start in the early 1970s, when Sheila M. Eyberg was a clinical psychology intern at the Oregon Health Sciences University. She treated behavior problems with play therapy, in which a therapist coaches a child to describe his or her emotions during playtime, as a route toward self-acceptance. Eyberg noticed that her charges “seemed to calm down, ‘self-correct,’ and try to please me,” she wrote in *PCIT Pages: The Parent-Child Interaction Therapy Newsletter* in 2004. But, she penned, “their parents were not reporting similar experiences at home. Nor were they reporting changes in their children’s behaviors.” Instead of bonding with their parents, the kids were connecting with Eyberg.

Psychologist Constance Hanf, also then at O.H.S.U., was piloting an approach that addressed these concerns. She was training mothers to act as therapists for their children, who had developmental disabilities. A key target of Hanf’s program was the parent-child bond. According to attachment theory, that bond provides a secure base from which a child can explore the world and helps that child control his or her emotions. In Hanf’s therapy, parents built that connection while playing a game of the child’s choosing. As one of Hanf’s students, Eyberg constructed PCIT around her teacher’s scaffold.

Last summer Laura (not her real name), a fun-loving young mother, gave a textbook demonstration of this element of PCIT during one of her therapy sessions. Her son, whom I will call Gabriel, a small six-year-old with light brown, curly hair, had just created a robot out of magnets.

“Oh, you choose to play with the magnets!” Laura says. “Beautiful robot. I love it.”

“Now it’s a castle,” Gabriel says of his creation. Gabriel has ODD.

“It’s so smart—you converted a robot into a castle,” his mother says.

Gabriel sticks out his tongue. “You’re sticking out your tongue,” Laura narrates.

“People hate him so he started to transform,” Gabriel says of his robot.

“That’s very smart,” his mother compliments. “Thank you for telling me the whole story.” Gabriel starts speaking in a funny, robotic voice. Laura copies him.

“Your imagination flies like your robot,” Laura says. “You can come up with different designs like this. It’s amazing to me.”

Laura describes and imitates Gabriel’s actions, repeats what he says—all of which let the child lead—and acts happy and relaxed. Laura’s behavioral descriptions also show she is interested, demonstrate proper speech and help Gabriel stay focused on the task. Laura frequently praises the boy, telling him exactly what she likes about what he is doing. In addition, parents are told to ignore minor misbehavior, so that the child learns

ONLY 19 percent of the parents who received the intervention were reported again for child abuse, compared with 49 percent of those who attended a standard parenting group.

that only behaving appropriately earns him attention. Laura has met the criteria for mastery: in five minutes, she issues five behavioral descriptions, five reflections, 15 praises, and fewer than three commands, questions and criticisms.

The second phase of PCIT, which Maria and Ryan were just starting, is directed at limit setting and discipline. It is also based on Hanf’s therapy, which included a component geared toward controlling behavior. Parents guide a child with clear instructions and consistent consequences, such as praise for compliance and time-out for disobedience. Parents graduate from this phase when three quarters of their commands are direct and the child complies with all of them.

Laura is close. Gabriel complies with some but not all of her requests. When Laura says she wants to do a puzzle, Gabriel protests: “I am tired of listening! I don’t want to do this. Can we go out?” Gabriel does not work on the puzzle for long, but he does eventually agree to sit next to Laura and put the pieces away—and he never needs to sit in the time-out chair, although Laura threatens to put him there.

Gabriel and Laura have already come

a long way. Earlier in the year Gabriel had been very unhappy and angry. He acted aggressively toward Laura and refused to obey her. “Get ready for bed or get ready for school ... to get him to do anything was very, very hard,” Laura recalls. Now Gabriel complies with her requests much more often. “When I ask him to turn off the iPad, he hands it to me,” Laura says. “He knows that if he doesn’t, there’s a consequence.”

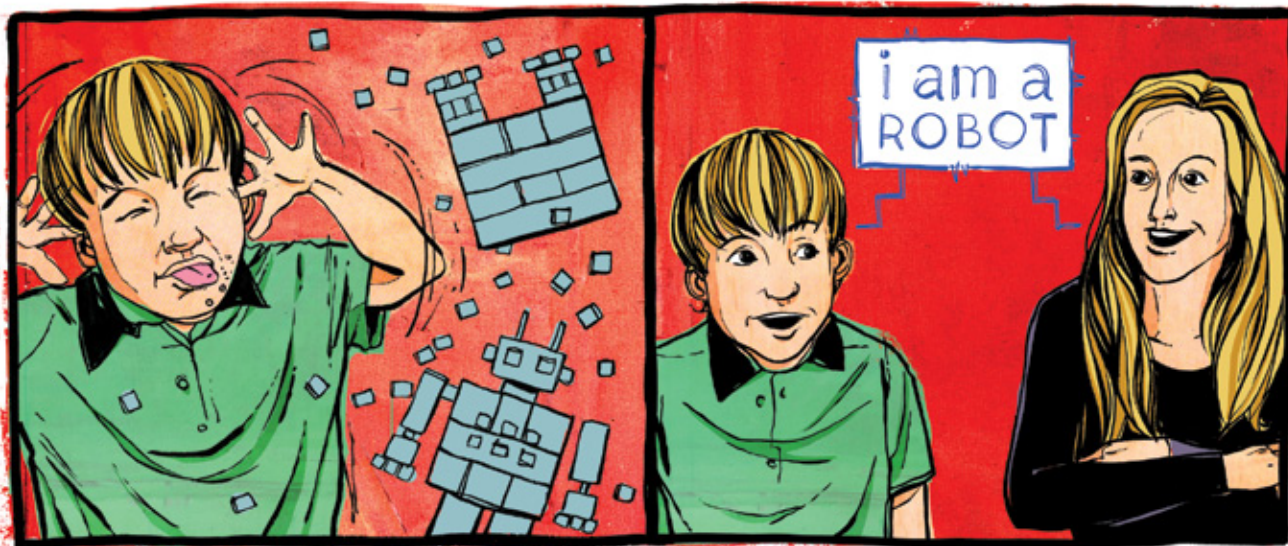
In one landmark test of the therapy, published in 1998, Eyberg, now at the University of Florida, and her colleagues gave PCIT to 22 families of three- to six-year-old children with ODD and assigned 27 others to a waitlist. The parents who received treatment interacted with their children more positively, praising them more and criticizing them less, than those on the waitlist. The children of the parents who participated in PCIT, in turn, were more likely to do what was asked of them. These parents noted large improvements at home as well, rating their child’s behavior within the normal range, on average, by the end of treatment. Many of these kids no longer qualified for a diagnosis of ODD. A 2003 study revealed that the treated children became even easier to handle in the following three to six years, perhaps because children and parents reinforce one another’s good behavior over time.

In a 2007 meta-analysis (statistical review) of 13 studies of PCIT, psychologists Rae Thomas and Melanie J. Zimmer-Gembeck, both then at Griffith University in Australia, confirmed that the therapy is linked to significantly improved parenting and reduced negative behavior in kids. It boosts warmth from parents, decreases their hostility and reduces their stress. It also diminishes aggression and oppositional behavior among children.

The success of PCIT is thought to stem, in part, from its emphasis on re-

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When a parent repeats what her child says, she lets the child lead, encourages conversation, and shows she is engaged. Such mimicry improves the parent-child relationship—and, ultimately, the child's behavior.

hearsal of a particularly relevant set of skills. In a meta-analysis of 77 investigations of parent-training programs published in 2008, Kaminski and her colleagues found that requiring parents to practice the appropriate actions with their children during the training sessions seemed to be critical to correcting parent behavior. Kaminski's team also noted that parent proficiency tended to improve whenever moms and dads were taught to talk to their kids about emotions and to effectively listen to them. In addition, the researchers identified the two essential elements to boosting children's behavior ratings: instructing parents to interact positively with their children—expressing enthusiasm and following the child's lead—and to respond consistently to a child's actions.

Child Protection

Sometimes the child is not the problem; the parent is. Parenting education and training has been a staple in child welfare for decades. Typically parents discuss their experiences and strategies in groups, but such conversations often fail

to change the family dynamic, and parental neglect or abuse persists.

In the early 2000s Mark Chaffin, a child abuse researcher at the University of Oklahoma Health Sciences Center, wanted to test PCIT with such parents on the grounds that teaching skills might be more effective than discussing concepts. The state child welfare system sent him 110 adults who had been reported multiple times for physical abuse of their children. The parents received 12 to 14 one-hour sessions at the university's large PCIT center. In addition, Chaffin required these mothers and fathers to participate in a motivational exercise. "If your five-year-old is driving you crazy, you are fairly motivated," Chaffin explains. "But we were concerned that people coming from child welfare would not be happy to be sent to a program." In Chaffin's program, parents were asked to consider their parenting goals

and whether their actions aligned with those goals.

The combination approach worked. More than two years later only 19 percent of the parents who had received both PCIT and the motivational interview had been reported again for abuse—compared with 49 percent of those who had been assigned to a standard parenting group, according to a 2004 study by Chaffin and his colleagues. "We got large effect sizes in reduction of child welfare recidivism," something that is hard to budge, Chaffin says.

In a follow-up trial published in 2011, Chaffin's team extended these results to more severe cases of abuse and neglect and a more realistic therapeutic setting: a small inner-city agency under contract with the state's child welfare system. Among 192 parents who had averaged six prior referrals to child welfare, a motivational interview along with PCIT led to a recidivism rate of around 17 percent two and a half years later, compared with about 65 percent for those who received standard group therapy along with a motivational interview.

“Even if you are motivated, typical group therapy doesn’t give you a lot of benefit,” Chaffin concludes.

The children involved in Chaffin’s studies ranged from four to 12 years old, so he and his colleagues adapted the treatment to older kids. Time-outs were replaced with logical consequences—such as taking away objects that a child is actively misusing—and loss of privileges. And praise was less demonstrative. Instead of exclaiming “What a nice tower!” to a child playing Legos, a father might challenge his 11-year-old son to a tower-building race. “Oh, you’re killing me!” the dad might praise. In a 2012 case study, Eyberg and her colleagues also found that PCIT greatly improved the newly aggressive and oppositional behavior of an 11-year-old who had suffered a traumatic brain injury from a gunshot wound.

“Please Hand Me the Pink Doughnut”

PCIT holds useful lessons for more ordinary circumstances as well: ignore bad behavior, praise good; tell a child what *to* do rather than what *not* to do; phrase commands as such, not as ques-

INSTEAD OF exclaiming “What a nice tower!” to a child playing Legos, a father might challenge his 11-year-old to a tower-building race. “Oh, you’re killing me!” the dad might praise.

tions or suggestions. Indeed, Eyberg and her colleagues found that two abbreviated versions of the technique significantly improved the behavior of 30 three- to six-year-olds whom their mothers had characterized as having moderate behavior problems. Both a four-session group intervention and written materials describing how to practice PCIT garnered similar benefits, suggesting that hands-on coaching may not be necessary in milder cases.

Back at the Child Mind Institute, Ryan has calmed down but balks at the suggestion that he play his mother’s game. Soon he is sent to the time-out chair, but he will not sit there voluntarily and gets up repeatedly. Then, before he can be moved to the time-out room, he kicks his mother and pushes *her* into the room, locking her inside, and then knocks over all the big metal chairs. Kurtz intervenes.

For more than an hour, Ryan goes from the time-out room to the time-out chair and back again, crying and protesting. “I’ll kill you! I’ll kill you! You’re nuts!” he shouts. Maria remains calm. She smiles and laughs to help ease the tension.

Finally, Ryan elects to stay in the chair, so Maria attempts a command. She tells Ryan to come sit next to her. “To do what?” he challenges. He is sent back to the chair. Yet again he stays there, whimpering. Twenty minutes later, in response to a period of relative silence, Maria says. “You’re sitting quietly. Are you ready to come and sit with me?” “Yes.” He walks over to her, sobbing softly.

“Okay. Please hand me the pink doughnut.” He finds the pink doughnut from a smattering of plastic toys spread out on the table—and hands it to her.

“Thank you for doing what I told you.” She pets his face and smiles. He is still teary.

“Now please hand me the banana.” He does.

“Yay! Good listening.” She kisses him. Ryan brings his mom one more item, a plastic potato chip, before Kurtz ends the session.

That afternoon Ryan passed another milestone. When Kurtz enters the room, Maria flashes a wide smile. She gives Kurtz a thumbs-up, and the two exchange a high five. Ryan does not feel like celebrating, however. “I had a very hard day,” he sighs. **M**

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attention

A game-style intervention for preschoolers might prevent ADHD from developing, reducing reliance on medications

**By Emily
Laber-Warren**

ILLUSTRATIONS BY
PJ LOUGHRAN

CONCENTRATE



From the start, Tzipora Gold was a smart and loving little girl, with a strong independent streak and tons of energy. During infancy and toddlerhood, her family noticed nothing amiss. But when Tzipora entered preschool, she did not listen to the teacher or sit in a circle. “I had never in my life thought that a three-year-old could get sent to the principal’s office,” recalls her mother, Sara Gold of New York City, a graphic designer. “But *she* was. I pulled her out in the middle of the year because they couldn’t handle her. And this was supposed to be a top-of-the-line preschool.”

A few months later Gold began seeing flyers posted by psychologists at nearby Queens College. The researchers were seeking unusually distractible, talkative and active children for a study. Gold signed up Tzipora. She had just turned four.

Plenty of four- and five-year-olds zoom around and have trouble paying attention, but those who qualified for the Queens College study, like Tzipora, were at the extremes. These youngsters showed early signs of attention-deficit hyperactivity disorder (ADHD), a condition associated with a variety of challenges, including trouble with attention, impulsivity and poor school performance.

ADHD affects around 10 percent of children in the U.S., according to the Centers for Disease Control and Prevention. It is typically diagnosed at age seven or eight, when a child’s inability to sit still and focus conflicts with the increasingly academic de-

mands of elementary school. Pediatricians and psychiatrists often prescribe drugs such as Adderall and Ritalin, which can dramatically increase productivity and motivation. Yet the drugs have side effects, such as insomnia and loss of appetite, and many parents are uncomfortable medicating their children so they will do better in school.

The Queens College psychologists are exploring a different treatment paradigm. They hope that by addressing signs of ADHD early—before the disorder has even been diagnosed—it may be possible to change kids’ brains so that they never get ADHD or, if they do, are less seriously afflicted. The treatment is a five-week series of games designed to strengthen focus, planning ability, memory and impulse control. It draws from growing evidence that the brains of very young children are furiously sprouting new connections, creating a window of opportunity for learning that slows after age five. Two such programs are in development in the U.S.: the one at Queens College and another at Cincinnati Children’s Hospital Medical Center. A similar intervention, the New Forest Parenting Program, is already in use in the U.K. and attracting interest from psychologists and educators in Brazil, France, Hong Kong and Japan. “We’re trying to capitalize on the fact that the brain is changing rapidly and forming and laying down those connections early on,” says psychologist Leanne Tamm, who is developing the Cincinnati early intervention program.

ADHD brain-training programs are deceptively simple, many of them involving variations on Simon says, I spy, Jenga and freeze dance. Parents and children learn them during weekly laboratory visits, but the real work happens at home, where everyone is expected to repeat the activities on a near-daily basis. (In the U.K. program, trainings also take place in families’ homes.) The approach seems to work: recent results from small early trials were impressive enough that the National Institute of Mental Health is underwriting larger ones. “The idea of early intervention is building,” says Jeffrey M. Halperin, the psychologist leading the Queens College study. “The hope is that we can change the long-term trajectory of the disorder.”

Outgrowing ADHD

ADHD runs in families, and evidence suggests a strong genetic component. “Very few, at this point, think that bad parenting or bad teachers cause ADHD,” Halperin says. “It really is a brain disorder. There is compelling evidence for that.” But about half of children with ADHD eventually outgrow it,

FAST FACTS

PAY ATTENTION

- 1 By addressing signs of attention-deficit hyperactivity disorder very early, some psychologists hope they can prevent the problem from arising.
- 2 Treatments under development involve teaching children and their parents a wide variety of games designed to strengthen focus, planning ability, memory and impulse control.
- 3 The brains of very young children are furiously sprouting new connections, creating a window of opportunity for learning that slows after age five.

although no one knows why. In a 2008 study Halperin and his colleagues tried to understand what differentiates individuals whose ADHD persists from those who get better. They tracked down 98 adolescents and young adults who had ADHD as children and gave them tests of verbal, reasoning and math skills, among other mental abilities.

To the researchers' surprise, they found that those who had recovered from ADHD and those who had not had many similar brain impairments. For example, both groups had trouble consistently focusing during 15 minutes of computer-based exercises. Yet those who overcame the disorder had developed especially strong higher-level thinking skills and mental control, abilities that seemed to compensate for their deficits. These skills reside in the prefrontal cortex, a brain area that because it continues to develop throughout childhood offers the potential for change.

That study inspired Halperin to create a preschool brain-training program. His thinking was that if for some children the natural course of brain development counteracts ADHD, exercises specifically designed to promote that growth might help people shed the symptoms—if not the underlying biology—of the disorder.

Child's Play

Five children watch while a young woman puts six plastic cups upside down on a table. Underneath each she places an M&M. "We are going to take turns lifting a cup," she tells the children. "If you find a piece of candy, you may eat it." And so begins a memory game called remember the treasure, in which candy rewards serve as motivation. Children must watch carefully as their peers make their



In the game remember the treasure, children must keep track of which cups have been lifted so they can pick one that still conceals a piece of candy.

mind several pieces of information, an ability known as working memory that is related to attention and is essential to effective reasoning, planning and problem solving. Games such as remember the treasure enhance working memory because children have to keep track of which cups have been lifted. Another working memory exercise is a list game, in which one person recounts several things,

THOSE WHO OVERCAME the disorder had developed especially strong higher-level thinking skills and mental control.

moves, endeavoring to recall which cups have been lifted, so that when their turn comes they will choose a cup that still conceals an M&M.

The children are gathered in a cheerful blue room at Queens College decorated with decals of monkeys and vines, birds and leaves. As they become more adept, the game intensifies. The leader next instructs the children to save the M&Ms they find rather than eating them. Whenever they err by choosing an empty cup, they must forfeit one of their hoarded sweets, placing it under the cup.

Kids with ADHD often have trouble holding in

such as activities he did that day or places she has gone on vacation. Players then must name one of the things on the list or, as the game intensifies, repeat all of them in order or, harder still, backward.

Children with ADHD also struggle with impulsivity, so delaying gratification is built into some of the games. The instruction to save the M&Ms is one example. Another activity, used in the Cincinnati program, involves giving children a banana and asking them to notice as much as they can—what it smells like, whether the skin is smooth or rough, what shape it is—before eating it. The programs also

use variations on games such as freeze dance and Simon says to help kids learn to abruptly terminate an activity or train of thought.

Picture puzzles such as the ones in *Highlights* magazine, where unexpected items are hidden in the background, help children hone their ability to concentrate and attend to details. In addition, because kids with ADHD can get wound up and have trouble regulating their emotions, some of the early intervention programs also include meditation and relaxation and sensory awareness exercises.

Parental Advisory

While the children play in the nature-themed room at Queens College, their parents are learning the same games in a conference room across the hall. Parents are expected to practice the games with their children daily, gradually increasing their complexity. “I describe it to the parents as: you go to the gym to



Games such as freeze dance coach kids to abruptly stop what they are doing.

build your muscles; you come here to build your kids' brains," Halperin says. "If you lift five-pound weights forever, you're not going to get anywhere."

Parents are encouraged to incorporate the activities into daily life. Memory games can be adapted to morning routines ("please go brush your teeth, then put on your shoes and get your backpack"). The British program employs a timer to teach children to take turns—patience is easier when kids know how long they must wait—and parents find the device also increases self-control at mealtimes. Setting the

timer for a few seconds at first, and then for longer intervals, helps kids learn to wait for dessert. "We want to teach them to apply those skills in real-life contexts," Tamm says.

In addition, the psychologists help parents better understand ADHD so they can tolerate their children's difficult behavior. Kids with ADHD may be intrusive and annoying. Their impulsivity may lead them to blurt out an inappropriate comment or to ask repeatedly for something they want, even if it involves interrupting or bothering someone. Their trouble paying attention and following rules may appear to be willful disobedience.

As a result, rifts often arise because repeated parental criticism creates poor self-esteem and defiance [see "Behave!" by Ingrid Wickelgren, on page 54]. Explaining to parents that their children's behavior is not intentional can help nip conflicts in the bud. "At this age, the negative cycles that so often develop between parents and their ADHD kids haven't really started yet," says psychologist Edmund Sonuga-Barke of the University of Southampton in England, one of the developers of the New Forest program.

Early results from these interventions are promising. In 2012 Halperin's team published findings from a pilot study conducted with 29 four- and five-year-olds. The researchers asked parents and children to play the assigned games 30 to 45 minutes a day for five to eight weeks, introducing new games each week. Parental assessments of behaviors such as fidgeting, interrupting, not paying attention when spoken to, inappropriate running or climbing, and trouble taking turns improved significantly during the course of the study. Even more encouraging, parents and teachers reported that the gains persisted three months later.

A 2001 study by Sonuga-Barke's team in the U.K. was the first to demonstrate that parent-led, game-based interventions for preschoolers can improve ADHD symptoms. Halperin's recent study and one Tamm published in 2012 confirm that finding. Tamm's team determined that eight weeks of brain-building games with 24 youngsters led to measurable improvements in attention, working memory and the ability to mentally switch gears. Parents and teachers also reported fewer behavioral problems and less inattention in the children.

If early intervention continues to show promise,

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AFTER ONE GIRL discontinued her medication, her mother likened the Adderall to a dam that had been holding back her daughter's happiness.

advocates envision that the programs could be widely implemented at preschools and community centers. The cost would be low because the materials are simple—balls, string, jump ropes, plastic cups—and facilitators need no special expertise. And the exercises would benefit all children.

“Last Year She Was That Kid”

Preschool brain-building programs are not yet available in the U.S. The two main ADHD treatments are behavior therapy and medication. A landmark 1999 study funded by the NIMH found that the most effective approach is medication, either alone or combined with behavior therapy. Prescriptions are on the rise, and the drugs, which are generally stimulants, can immediately transform a jumpy kid into one who can apply himself or herself to learning the silent “e” or European history.

But stimulants can cause significant quality-of-life issues. Nessie Sax-Bolder, a 20-year-old premed student at a university in upstate New York, was diagnosed with ADHD in middle school. By college she was taking larger doses to help her manage an increasingly heavy course load. With Adderall, then Vyvanse, schoolwork became pleasant, never dull. She was superefficient, organized, on top of her game. Despite—or perhaps because of—the drugs’ ability to help her, Sax-Bolder wants to stop. The substances change her personality, she says, making her sharp-edged and tetchy. She also feels uncomfortable being so reliant on them. “I don’t like how dependent I am,” she says.

Personality changes are a common side effect of stimulants, according to pediatrician Sanford Newmark, an ADHD specialist at the University of California, San Francisco. Although many children tolerate the drugs, others can become emotionally flat, angry, anxious or lose the ability to feel joy. One mother who saw a dramatic change in her young daughter when she discontinued her medication told Newmark it was as if the Adderall were a dam holding back her happiness.

Even when stimulants help, the effects are temporary. Medicated children are just as likely to have ADHD as adults, with all the attendant risk factors: lack of job satisfaction and stability, relationship woes, addiction. Meanwhile, in Europe, Asia and South America, where many health professionals disapprove of stimulant treatment, a nonpharma-

ceutical approach draws great interest. “All these countries are very keen,” says Sonuga-Barke, the Southampton researcher whose program is now being tested in Japan and Denmark.

Here in the U.S., Tzipora Gold is one of a very few children who have experienced the experimental play-based approach. One of the first changes her mother noticed after Tzipora began participating in the Queens College study was at bedtime. Every night at seven o’clock Sara Gold would put her daughter to bed after a calming routine of a warm bath and stories, but Tzipora would spend the next two hours bouncing, singing to herself or knocking on the window to get the attention of passersby. The early intervention program taught Tzipora how to focus on her breathing and relax her muscles. Soon she was falling asleep within 20 minutes.

When walking with her daughter, Sara began playing upbeat songs on her cell phone and practicing the freeze dance game. Eventually Tzipora began stopping when her mother called out, and Sara no longer feared she would dart into the street.

At her new preschool, Tzipora received occupational therapy and was assigned an aide who coached her on proper classroom behavior. Last fall, when Tzipora entered kindergarten, she no longer needed an aide. “She’s a different kid in the classroom, like a new person,” her mother said. “There’s a kid in her class she comes home telling me stories about, saying that he’s a troublemaker and he doesn’t listen. Last year she was that kid.” **M**

FURTHER READING

- **Neuropsychological Outcome in Adolescents/Young Adults with Childhood ADHD: Profiles of Persisters, Remitters and Controls.** Jeffrey M. Halperin et al. in *Journal of Child Psychology and Psychiatry*, Vol. 49, No. 9, pages 958–966; September 2008.
- **ADHD without Drugs: A Guide to the Natural Care of Children with ADHD.** Sanford Newmark. Brigham Distributing, 2010.
- **An Open Trial of a Metacognitive Executive Function Training for Young Children with ADHD.** Leanne Tamm, Paul A. Nakonezny and Carroll W. Hughes in *Journal of Attention Disorders*. Published online May 29, 2012.

From Our Archives

- **Calisthenics for a Child's Mind.** Ingrid Wickelgren; May/June 2013.
- **ADHD Grows Up.** Tim Bilkey, Craig Surman and Karen Weintraub; January/February 2014.



Is Depression Just Bad Chemistry?

The disorder is complex and has so far eluded a simple biological explanation

BY HAL ARKOWITZ AND SCOTT O. LILIENFELD

A **COMMERCIAL** sponsored by Pfizer, the drug company that manufactures the antidepressant Zoloft, asserts, “While the cause [of depression] is unknown, depression may be related to an imbalance of natural chemicals between nerve cells in the brain. Prescription Zoloft works to correct this imbalance.” Using advertisements such as this one, pharmaceutical companies have widely promoted the idea that depression results from a chemical imbalance in the brain.

The general idea is that a deficiency of certain neurotransmitters (chemical messengers) at synapses, or tiny gaps, between neurons interferes with the transmission of nerve impulses, causing or contributing to depression. One of these neurotransmitters, serotonin, has attracted the most attention, but many others, including norepinephrine and dopamine, have also been granted supporting roles in the story.

Much of the general public seems to have accepted the chemical imbalance hypothesis uncritically. For example, in a 2007 survey of 262 undergraduates, psychologist Christopher M. France of Cleveland State University and his colleagues found that 84.7 percent of participants found it “likely” that chemical imbalances cause depression. In reality, however, depression cannot be boiled down to an excess or deficit of any particular chemical or even a suite of chemicals. “Chemical imbalance is sort of last-century thinking. It’s much more complicated than that,” neuroscientist Joseph Coyle of Harvard Medical School was quoted as saying in a blog by National Public Radio’s Alix Spiegel.

Indeed, it is very likely that depression stems from influences other than neurotransmitter abnormalities. Among the problems correlated with the disease



are irregularities in brain structure and function, disturbances in neural circuitry, and various psychological contributions, such as life stressors. Of course, all these influences ultimately operate at the level of physiology, but understanding them requires explanations from other vantage points.

Are Your Chemicals out of Balance?

Perhaps the most frequently cited evidence in support of the chemical imbalance hypothesis is the effectiveness of antidepressants, many of which increase the amounts of serotonin and other neurotransmitters at synapses. Zoloft, Pro-

zac and similar selective serotonin reuptake inhibitors (SSRIs) result in such an increase and can often relieve depression, at least when it is severe. As a result, many believe that a deficiency in serotonin and other neurotransmitters causes the disorder. But just because a drug reduces symptoms of a disease does not mean that those symptoms were caused by a chemical problem the drug corrects. Aspirin alleviates headaches, but headaches are not caused by a deficiency of aspirin.

Evidence against the hypothesis comes from the efficacy of a newly developed antidepressant, Stablon (Tianeptine), which *decreases* levels of serotonin

COURTESY OF HAL ARKOWITZ (Arkowitz); COURTESY OF SCOTT O. LILIENFELD (Lilienfeld); GETTY IMAGES (Illustration)

at synapses. Indeed, in different experiments, activation or blockage of certain serotonin receptors has improved or worsened depression symptoms in an unpredictable manner. A further challenge to the chemical imbalance hypothesis is that many depressed people are not helped by SSRIs. In a 2009 review article psychiatrist Michael Gitlin of the University of California, Los Angeles, reported that one third of those treated

tive in depressed people. Some parts of the prefrontal cortex also show diminished activity, whereas other regions display the opposite pattern. The subcallosal cingulate gyrus, a region near the anterior cingulate, often shows abnormal activity levels in depressed individuals. These differences may contribute to depression, but if they do, scientists are not sure how.

In 2012 neurosurgeon Andres M. Lozano of the University of Toronto and

Seeing the Elephant

Throughout this column, we have described associations between various brain changes and depression. We have not talked about “causes,” because no studies have established a cause-and-effect relation between any brain or psychosocial dysfunction and the disorder. In addition, depression almost certainly does not result from just one change in the brain or environmental factor. A fo-

Among the problems correlated with depression are irregularities in brain structure and **psychological stress.**

with antidepressants do not improve, and a significant proportion of the remainder get somewhat better but remain depressed. If antidepressants correct a chemical imbalance that underlies depression, all or most depressed people should get better after taking them. That they do not suggests that we have only barely begun to understand the disorder at a molecular level. As a result, we must consider other, nonchemical leads.

This Is Your Brain on Depression

A possible clue lies in brain structures. Imaging studies have revealed that certain brain areas differ in size between depressed and mentally healthy individuals. For example, the amygdala, which responds to the emotional significance of events, tends to be smaller in depressed people than in those without the disorder. Other emotional regulatory centers that appear to be reduced in volume are the hippocampus, an interior brain region involved in emotional memory, the anterior cingulate cortex, which helps to govern impulse control and empathy, and certain sections of the prefrontal cortex, which plays an important role in emotional regulation. Nevertheless, the effects of these shrinkages on depression, if any, remain an open question.

Neuroimaging studies have revealed that the amygdala, hypothalamus and anterior cingulate cortex are often less ac-

his associates studied the effects of deep brain stimulation of the subcallosal cingulate gyrus in depressed patients who had not benefited from standard treatments. The intervention led to a significant reduction in symptoms of depression, supporting the idea that a dysfunction in this brain area may be involved in the illness.

Findings also point to a crucial role for psychosocial factors such as stress, especially when it arises from a loss of someone close to you or a failure to meet a major life goal. When someone is under a good deal of stress, a hormone called cortisol is released into the bloodstream by the adrenal glands. Over the short term, cortisol helps humans cope with dangers by mobilizing energy stores for flight or fight. But chronically high cortisol levels can harm some bodily systems. For example, at least in animals, excess cortisol reduces the volume of the hippocampus, which in turn may contribute to depression. Despite such data, we still do not know if stress alters the human brain in ways that can lead to depression.

cus on one piece of the depression puzzle—be it brain chemistry, neural networks or stress—is shortsighted.

The tunnel-vision approach is reminiscent of a classic story in which a group of blind men touch an elephant to learn what the animal looks like. Each one feels a different part, such as the trunk or the tusk. The men then compare notes and learn that they are in complete disagreement about the animal’s appearance. To understand the causes of depression, we have to see the entire elephant—that is, we must integrate what we know at multiple scales, from molecules to the mind to the world we live in. **M**

HAL ARKOWITZ and SCOTT O. LILIENFELD serve on the board of advisers for *Scientific American Mind*. Arkowitz is an associate professor of psychology at the University of Arizona, and Lilienfeld is a psychology professor at Emory University. The authors wish to thank Francisco Moreno and Alfred Kaszniak for their invaluable comments.

Send suggestions for column topics to editors@SciAmMind.com

FURTHER READING

- **The “Chemical Imbalance” Explanation for Depression: Origins, Lay Endorsement, and Clinical Implications.** Christopher M. France et al. in *Professional Psychology: Research and Practice*, Vol. 38, No. 4, pages 411–420; August 2007.
- **A Multicenter Pilot Study of Subcallosal Cingulate Area Deep Brain Stimulation for Treatment-Resistant Depression.** Andres M. Lozano et al. in *Journal of Neurosurgery*, Vol. 116, No. 2, pages 315–322; February 2012.

books

COGNITIVE PSEUDOSCIENCE

The Origin of Ideas: Blending, Creativity, and the Human Spark

by Mark Turner. Oxford University Press, 2014 (\$29.95)



In 1908 mathematician Henri Poincaré described the creative process as a collision of ideas rising into consciousness "in crowds ... until pairs interlocked." Soon after, Gestalt psychologist Norman Maier, behaviorist Clark Hull and others began studying how ideas and behaviors combined, and in the 1980s, in laboratory research with both animals and people, I showed that the combinatorial process was orderly and predictable and that it could be modeled on a computer.

But toward the beginning of *The Origin of Ideas*, Turner, a cognitive scientist at Case Western Reserve University, claims that he and a colleague "presented the first full presentation of research on blending" just 10 years ago. Worse still, the rest of the book contains no content that a biologist or physicist would consider "research" at all. Instead Turner describes a mythical mental world of entirely imaginary objects ("webs," "scaffolds," "bundles of thought") and vague mechanisms ("mental spaces are sewn together") and then uses his fanciful model to analyze, sometimes laboriously, basic human cognitive abilities and the content of dozens of books and movies—everything from the Bible to *Winnie-the-Pooh*.

The concept of punishment, Turner says, is necessarily a blend of two other ideas: that someone has done something wrong and that later the offender is penalized. Almost all ideas, in fact, are blends of other ideas. Blending is the "big lever" of the modern human mind, responsible for creativity, the vast capabilities of language and our ability to conceive of other minds.

Maybe so, but how can we know that the specifics of Turner's theory are correct or that his theory is better than others? He never shows us how to tell when the processes he is describing are not occurring. In other words, his theory is not falsifiable, a fatal flaw in science.

In fact, Turner violates just about every rule of good science: abstract concepts are treated as if they are real things;

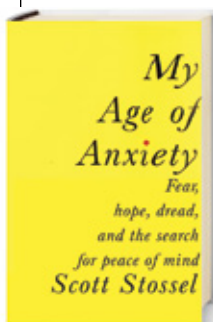
no aspects of the theory allow you to measure anything; it makes no specific predictions that can be tested; and so on. And then there's the tautology: blending explains creativity, Turner says, but people "create blends." See the problem?

Toward the end of the book, Turner finally gives up the farm, admitting that he is "skeptical" that experimental research on his blending model could ever be conducted. Reading *The Origin of Ideas*, in other words, is nothing like reading *On the Origin of Species*. It is more like reading Sigmund Freud's *Interpretation of Dreams*; its elegance and scope are reassuring until you realize you've been hoodwinked. At least Freudian theory had lots of sex. —Robert Epstein

WORRIED SICK

My Age of Anxiety: Fear, Hope, Dread, and the Search for Peace of Mind

by Scott Stossel. Knopf, 2014 (\$27.95)



Stossel, editor of the *Atlantic* magazine, comes out in *My Age of Anxiety* as a lifelong sufferer of anxiety disorders. In this sprawling exploration of his private torment, he shares personal anecdotes that might be scenes from a sitcom. As his wife is in labor with

their first child, Stossel, overcome by anxiety, faints by her side. As a houseguest at Hyannis Port, he flees from an overflowing toilet (a result of his nervous stomach) wearing only a sewage-soaked towel and bumps into John F. Kennedy, Jr.

In Stossel's mind, these are more than passing embarrassments, but rather evidence of his tenuous value as a human being. "I feel I am living on the razor's edge between success and failure, adulation and humiliation—between justifying my existence and revealing my unworthiness to be alive," he writes.

One in seven Americans has an anxiety disorder, making it the most common officially classified mental illness. Stossel's is a textbook case of anxiety pathology, from a specific phobia at age six (fear of vomiting), to social phobia at age 11, to panic disorder in his late teens and,

later, to agoraphobia and depression.

In an effort to understand his condition, Stossel surveys the latest science behind anxiety and finds many leads but few definitive answers. An overactive amygdala, low serotonin and dopamine levels, early childhood experiences and a handful of genes have been implicated, but none consigns a person to unhealthy anxiety. He discovers, for instance, that he has a variant of the *SERT* gene that some studies have linked to higher rates of anxiety disorders but only when combined with life stress.

The ancient Greeks debated whether anxiety was a medical illness (Hippocrates) or philosophical disharmony (Plato), a division still seen between today's psychopharmacologists and cognitive-behavior therapists. With the advent of new drugs in the 1950s, however, anxiety was increasingly advertised as a biological glitch to be repaired. Stossel chronicles the fascinating, often haphazard, development of anti-anxiety medications, noting that "every time new drug therapies come along, they raise the question of where the line between anxiety as psychiatric disorder and anxiety as a normal problem of living should get drawn."

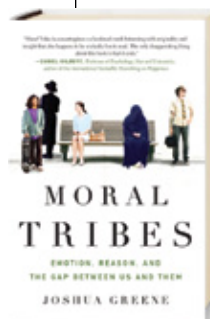
Decades of medication and therapy have offered Stossel only partial relief, and this book is his way of making peace with a problem he may never leave behind. He carefully—you might even say anxiously—considers his subject from all angles. His exhaustive research spills over into lengthy footnotes, and occasionally the book feels scattered and searching. Even in the last chapter, "Resilience," he does not sound hopeful; he has found more questions than answers—but he has survived yet again.

—Nina Bai

ETHICAL CONUNDRUMS

Moral Tribes: Emotion, Reason, and the Gap between Us and Them

by Joshua Greene. Penguin Press, 2013 (\$29.95)



We begin on a serene pasture inhabited by a tribe of shepherds. Motivated by personal wealth, one by one the herders

begin adding more sheep to their individual flocks. Soon enough the once lush meadow is overrun, and ultimately the sheep destroy it. Such is the tragedy of

the commons, the idea that people acting out of self-interest will deplete shared resources to the detriment of the group.

In his new book, Harvard University psychologist Greene uses the concept of the tragedy of the commons to explain moral behavior. He argues that our moral brain evolved to promote cooperation within groups, not between them. Groups will differ in their views, causing conflict. We see this clash of morals play out today among different racial groups, religious factions and warring nations.

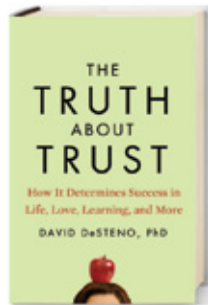
To better understand how moral conflicts arise, Greene turns to neuroscience. Based on his functional MRI studies, he proposes that our moral brain operates like a dual-mode camera: it has an automatic setting, for emotional instincts, and a manual setting, for logical reasoning (a concept first popularized by psychologist Daniel Kahneman). When dealing with moral dilemmas, we instinctively react emotionally, but if we step back from the situation, logical reasoning can override a gut reaction.

To illustrate the moral brain at work, Greene describes the famous trolley problem, in which a bystander must choose whether to send a man to his death to save five men. If we identify with the solo man, we are more likely to react emotionally (automatic setting) and want to save him, but if we can think logically about the greater good (manual setting), we often choose to save five lives at the expense of one. Greene explores thorny issues, such as physician-assisted suicide, abortion and capital punishment, through the lens of moral tribalism.

Moral Tribes weaves together age-old philosophical musings, theoretical and real-world problems, and recent brain research, but Greene is at his best when describing his personal journey investigating the mysteries of the moral brain. In his ambition to cover so much territory, however, he goes on too many tangents and at times loses the reader in minutiae.

Greene's main objective here is to begin developing a unified system of morality that promotes cooperation among all groups. Although he does not accomplish this lofty goal, he nonetheless furthers our understanding of the moral brain. Looking out for the best interest of the global community, he believes, will move us closer to a morally united world.

—Brian Mossop



► CHOOSE WISELY

The Truth about Trust: How It Determines Success in Life, Love, Learning, and More

by David DeSteno.
Hudson Street Press,
2014 (\$25.95)

When a person proposes marriage, she or he takes a leap of faith. Trust, writes psychologist DeSteno, is essential to all relationships. It bonds family and friends and guides important decisions. When a friend or partner turns out to be disloyal, the stakes can be high. So how do we know when to trust someone?

DeSteno reveals that two key traits help to determine trustworthiness: competence, whether a person appears informed and experienced, and reliability, whether a person will remain honest and dependable over time. Studies exploring competence show that children instinctively tend to prefer a knowledgeable teacher over a friendly one, and adults often elect officials who appear in control.

Reliability is harder to gauge because trust also involves predicting someone's motives or future actions. We tend to believe that future circumstances will mirror present ones, and we find it difficult to envision the circumstances that can dramatically alter behavior. This challenge comes up in every long-term relationship, including the one we have with ourselves. We believe we can stick to a diet, for example, but underestimate how easily we will give in to temptation after a difficult day. To plan for tough times, DeSteno advocates being realistic, honest, and forgiving with yourself and others.

What about trusting strangers? DeSteno believes that an innate trust barometer kicks in. His research shows that subtle, nonverbal cues, such as crossing arms, leaning away or touching your face, can signal whether a person is deceitful.

Unfortunately, DeSteno does not present brain-level explanations of trust; he asserts instead that neuroscience is not yet sophisticated enough to tell us anything meaningful about the trait. Yet he does an excellent job presenting evidence and deriving practical conclusions for how trust works in everyday life.

Trust may be a gamble, but what is worse than being disappointed is closing ourselves off to potentially meaningful relationships. That, he says, is not a risk worth taking.

—Daisy Yuhua



ROUNDUP

►► Free Will

Three books explore the extent to which biology dictates our decisions

How much choice do we really have? In **We Are Our Brains: A Neurobiology of the Brain, from the Womb to Alzheimer's** (Spiegel and Grau, 2014), neuroscientist D. F. Swaab attempts to answer this age-old question by chronicling brain development from birth to death. He concludes that biology dictates the person we will become starting in the womb and that free will thus does not exist. Swaab admits, however, that his ideas are not meant to be conclusive but to help inform our understanding of human nature.

Perhaps a lack of free will can be understood best through our ancestral past. In **The Rational Animal: How Evolution Made Us Smarter Than We Think** (Basic Books, 2013), psychologist Douglas Kenrick and business professor Vlas Griskevicius argue that our decisions, even seemingly illogical ones, are driven by deep-seated evolutionary urges to survive and thrive. Compelling as the theory may be, at times the authors try too hard to fit all the evidence into their model.

Although our genetic endowment strongly influences decisions, the late education expert Michael E. Martinez posits that we do in fact have the power to choose. In **Future Bright: A Transforming Vision of Human Intelligence** (Oxford University Press, 2013), Martinez argues against long-held views that intelligence is fixed at birth. Drawing on cognitive research and decades as an educator, he provides strategies to sharpen the brain that range from simple tips, such as reading and exercising, to more difficult tasks, such as uncovering and nurturing hidden talents.

—Victoria Stern

asktheBrains

It is unlikely that cardiac surgery significantly alters how the brain works.

Can heart surgery change a person's personality? —via e-mail



James L. Rudolph, acting clinical chief of the division of aging at Brigham and Women's Hospital, provides an answer:

TO DATE, no study has adequately examined whether heart surgery can change a person's personality, mainly because personality is difficult to define and measure. When recovering from heart surgery, some patients report trouble remembering, slower mental processing and difficulty focusing. Although this condition, often referred to as "pumphead," is usually short-lived, one study of bypass patients has suggested that the associated cognitive changes might worsen over time. Related research, however, indicates it is unlikely that cardiac surgery significantly alters how the brain works.

Coronary artery bypass surgery, the most common heart operation in adults, helps to increase blood flow to the cardiac muscle when the heart arteries have be-

come too narrow. During the surgery, a patient's brain is subjected to many stressors, which may include medications, sleep deprivation, inflammation and blood clots. Normally the brain is protected from such assaults by the blood-brain barrier, a membrane that walls off the organ from the bloodstream. Yet when our arteries narrow, the function of the blood-brain barrier may be disrupted, allowing circulating substances to enter the brain. The brain's reaction to such influences is as complex and individualized as the brain itself.

Still, many studies that have measured brain function, by evaluating such variables as cognitive performance and mood, before and after heart surgery have not found significant changes. For instance, in general, patients do as well or slightly better on cognitive tests one to three months after cardiac surgery, although any cognitive benefit is short-lived. When such patients are retested

three years later, their cognitive test performance tends to be similar to that of patients with narrowed heart arteries.

A recent analysis of studies that measured depression before and after heart surgery found that the number of patients with depression decreased after surgery. This benefit, however, very likely is related to patients overreporting their depression symptoms just before surgery.

The current evidence does not seem to support the idea that changes in cognitive ability or mood occur after cardiac surgery. Yet because no research directly looks at postoperative personality changes, we cannot say for certain that such alterations do not take place on a small scale. With further research we may develop a more nuanced understanding of how the brain responds under pressure.

What causes the brain to have slow processing speed, and how can the rate be improved? —Heather Walker, via e-mail



Geoffrey A. Kerchner, assistant professor of neurology and neurological sciences at the Stanford University School of Medicine, responds:

TO A BRAIN SCIENTIST, processing speed means just that: the rate at which a human can take in a bit of new information, reach some judgment on it and then formulate a response. Studies suggest that the speed of information processing changes with age along an inverted U-shaped curve, such that our thinking speeds up from childhood to adolescence, maintains a period of relative stability leading up to middle age, and finally, in late middle age and onward, declines slowly but steadily.

That processing speed slows with age is intuitive to most people. Many elderly individuals have noticed that it takes them longer to solve problems or make decisions than it did when they were young. Yet the reasons for this age-related deceleration in information processing are not completely understood and may vary from person to person. Some compelling evidence suggests that such a decline reflects wear and tear of the white matter in

the brain, which is made up of all the wires, or axons, that connect one part of the brain to another. Slowed information transfer along axons may impede processing speed. But what causes this axonal communication to slow down in the first place?

In some people, diabetes, smoking, high blood pressure or other so-called vascular risk factors can wear away at the blood vessels feeding the brain's white matter, starving axons of much needed oxygen and glucose. Some people may have a genetic predisposition to age-related white matter decay, a poorly understood but actively studied hypothesis. In other individuals, slowed processing speed could be the first sign of a neurodegenerative illness, such as Alzheimer's disease. Head trauma, including concussions, may play a role. These are a few of the many ideas out there—other factors surely remain to be discovered.

More important, slowed information processing affects almost every aging adult to some degree, and the line between normal and abnormal is fuzzy. A person may sustain or even improve information processing speed by paying close attention to vascular risk factors, engaging in regular aerobic exercise, eating well and continuing to challenge oneself intellectually. **M**

Have a question? Send it to editors@SciAmMind.com

Head Games

Match wits with the Mensa puzzlers

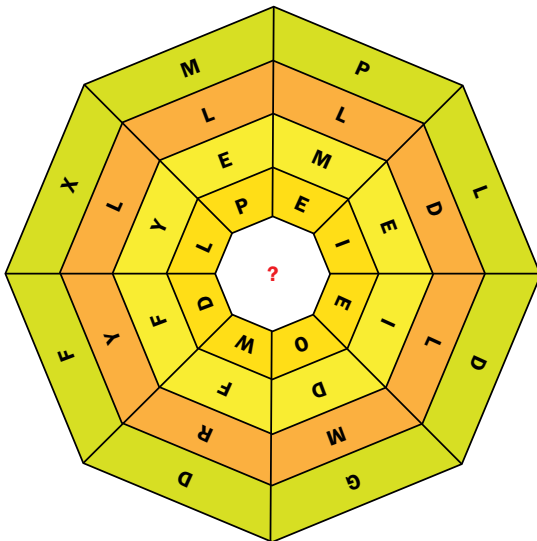
1 MATHAGRAM

Using all the digits from 1 to 9, you can construct many different additions (for example, $317 + 628 = 945$). Find the four combinations that add to a sum of 468.

1 X X	X X 5	X 9 X	X X X
+ X X X	+ X X X	+ X X X	+ X 7 X
4 6 8	4 6 8	4 6 8	4 6 8

2 COMMON GOAL

The scrambled words in each pie-shaped section share a common letter. Provide the missing letter and unscramble the words.



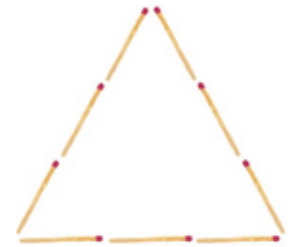
3 PROVERBIAL MYSTERY

All the vowels have been removed from the following proverb, and the remaining letters are arranged into groups of four (with three null X's at the end). Replace the vowels and restore the correct word breaks to discover the proverb.

LLTH TGLT TRSS NTGL DXXX

4 MEET YOUR MATCH

The following matchsticks make one triangle. Rearrange five of them to make five triangles.



5 FILL IN THE BLANKS

Each of the following words includes the letters MAR. Using the definitions, complete the words.

Type of boat: _____ M A R _____

Italian seafood: _____ M A R _____

Title of nobility: M A R _____

6 CAMOUFLAGED ANIMALS

Find the names of three mammals hidden in the following sentences. (All the letters are sequential and in the correct order.)

The large crowd at the flea market came looking for bargains.

I took off the peel and ate the banana.

He has no judgment, no sense altogether.

7 HAPPY ST. PATRICK'S DAY

The letters ERIN have been placed in the box below. Fill in each line so that those four letters are in each row: across, down and on the long diagonals. No two letters may be the same in any line.

E			
	R		
		I	
			N

8 ANAGRAM

Make as many common English words as you can from the letters DRIBA, using all the letters each time.



1. $193 + 275, 175 + 293, 195 + 273, 295 + 173$.
 2. The missing letter is A: AMPLE, MAPLE, AILED, IDEAL, DOGMA, DWARF, DAFFY AND LAXLY.
 3. ALL THAT GLITTERS IS NOT GOLD.
 4.

5. CATAMARAN, CALAMARI, MARCHIONESS.
 6. CAMEL, ELAND, SEAL.
 7.

E	I	N	R
R	N	E	I
I	E	R	N
N	R	I	E

 8. BRAID, RABID.

Answers

DO ZOMBIES EXIST?

THE ANSWER DEPENDS ON YOUR DEFINITION OF ZOMBIES

IF ZOMBIFICATION IS DEFINED AS MAKING AN ORGANISM BEHAVE WITHOUT A WILL OF ITS OWN, THEN ZOMBIES ARE COMMON IN NATURE.

A SPECIES OF FUNGI CALLED *OPHIOCORDYCEPS UNILATERALIS* INFECTS CERTAIN ANTS, MAKING THEM CLIMB PLANTS AND RELEASE SPORES THAT CAN INFECT NEW HOSTS.

JEWEL WASPS INJECT VENOM INTO ROACHES SO THEY CAN BE STEERED INTO THE WASP'S NEST, WHERE THEY ARE EATEN ALIVE.

BROODSAC WORMS INFEST THE EYESTALKS OF SNAILS, CAUSING THEM TO EMERGE DURING THE DAY. BIRDS THEN EAT THE WORMS WITH THE PULSATING EYES, HOST THE LARVAE, AND COMPLETE THE LIFE CYCLE.

BUT IF YOU DEFINE ZOMBIES AS REANIMATED HUMAN CORPSES, THEN THEY ARE MUCH LESS LIKELY.

WITHOUT A WORKING RESPIRATORY OR CIRCULATORY SYSTEM, YOUR BODY STOPS PRODUCING ATP (ADENOSINE TRIPHOSPHATE), A KEY ENZYME IN ENERGY PRODUCTION.

ATP POWERS MUSCLE CONTRACTION AND ALSO THE ION PUMPS IN NEURAL MEMBRANES.

WITHOUT ATP, ZOMBIES COULDN'T MOVE BECAUSE OF RIGOR MORTIS OR EVEN HAVE BASIC THOUGHTS LIKE HUNGER.

SO DON'T LET THE IDEA OF ZOMBIES EAT AT YOUR BRAIN...

IT'S A CONCEPT YOU CAN SAFELY LAY TO REST.

BY DWAYNE GODWIN & JORGE CHAM

● Dwayne Godwin is a neuroscientist at the Wake Forest University School of Medicine. Jorge Cham draws the comic strip Piled Higher and Deeper at www.phdcomics.com.

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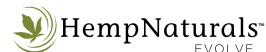


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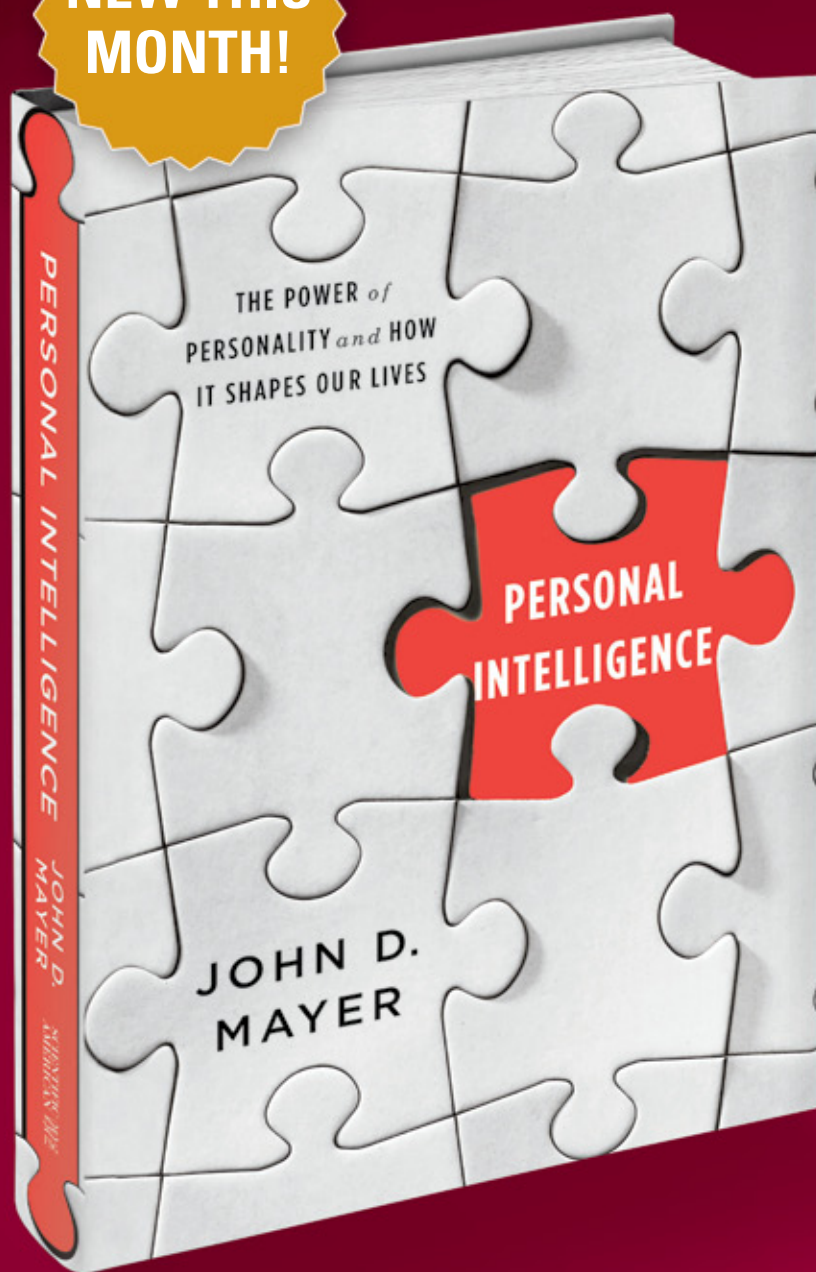
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—PETER SALOVEY, president and Chris Argyris Professor of Psychology, Yale University

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