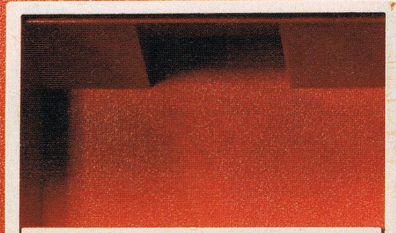




FEAR

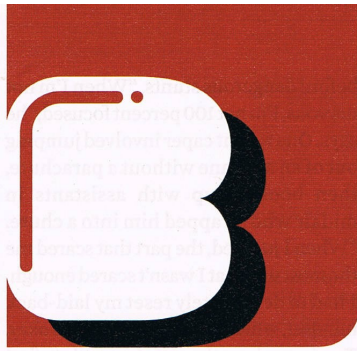


PULL DOWN



Pyr-A-Larm





BEFORE HE EVEN KNEW WHAT HE WAS doing, Tom Boyle Jr. was out of the truck and running. He'd been in the front seat of a pickup with his wife, feeling relaxed after a dinner at a Tucson mall, waiting for the line of cars in front of them to make a right turn out of the parking lot. The Camaro at the front of the queue lurched into the street, wheels squealing, and roared away trailing sparks.

"Oh God, do you see that?" his wife said.

Boyle saw it: the crumpled frame of a bike under the car's bumper, and tangled within it a boy, trapped. That's when Boyle got out and started running. For an agonizing eternity the Camaro screeched on, dragging the mass under it. As it slowed to a stop he could hear the bicyclist pounding on the car with his free hand, screaming. Without hesitating Boyle bent down, grabbed the bottom of the chassis, and lifted with everything he had. Slowly, the car's frame rose a few inches. The bicyclist screamed for him to keep lifting. Boyle strained. "It's off me!" the boy yelled. Someone pulled him free, and Boyle let the car back down.

The young man was bleeding badly. Boyle held him in his arms until the ambulance came. Then he sat on the curb, drained. He felt like he was going to throw up. He asked his wife to drive him home.

Today, looking back on that frightening evening, Boyle is deeply proud of how he helped the injured cyclist. But the one thing he still can't figure out is how he managed to lift the car. He's a strong guy, sure. But a Camaro weighs over a ton. "Today, right now," he says, "There's no way I could lift that car."

Boyle suddenly found himself in a zone that he had never before encountered. Thrust into the intensity of a life-or-death crisis, he experienced an ancient and automatic resolve. So strong is this force, so

alien to our normal conscious experience, that those who experience it report that it's like being possessed.

Most of us tend to think of fear as a negative, as something to be avoided. But fear can have powerfully positive effects as well. The emotion is evolution's way of keeping us safe in the face of danger. When awakened, it can unleash abilities we never knew we had, unlocking reserves that are otherwise hidden. Fear pulls out the stops, turning the dial, as *Spinal Tap* would have it, all the way up to 11.

Even low levels of fear can have a positive effect. A century ago, physiologists recognized that we tend to do better at a given task as the intensity of the challenge increases. Eventually we reach a performance maximum, beyond which our abilities begin to degrade. Taken together, these performance trends yield an inverted-U shape, known to psychologists as the Yerkes-Dodson law. Just when the peak occurs depends not only on the person but on the skill involved.

Figuring out how to maximize performance in the face of fear and other forms of stress is a hot area of study right now. Understanding fear's secret super powers can help you gain the upper hand when the chips are down.



Response

MILLIONS OF YEARS ago, our ancestors lived in a world in which danger was ever-present. Wild animals, natural disasters, rival clans—death could come at any time. Humans needed a danger-response system that was fast and vigorous.

Today, that same system remains with us, silently monitoring our environments. As sensory information enters the brain, it splits into two paths. One feeds into consciousness, where we can observe and remember it. The other flows through the subconscious, where a region called the amygdala filters it for signs of danger. When a match is found, the amygdala can trigger an automatic response so quickly that we might respond before we're consciously aware that there's a problem.

Tom Bittner was in the furnace room of a retirement home a few years back, looking at merchandise that was going to go on sale at an auction later that day,

when the old wooden floor suddenly gave way beneath his feet. Before he even understood what was happening, he had thrown out his arms to catch himself from falling down what turned out to be a forgotten well shaft. "I did it without thinking about it at all," he says. "I don't understand how I managed it."

While it takes about half a second for awareness of an outside event to enter consciousness, the fear system can begin responding in much less time. New York University neuroscientist Joseph LeDoux, who has spent his career elucidating the amygdala's pathways, says that the region can receive signals from the ears and eyes in just twelve-thousandths of a second.

What happens next depends on the situation. If the danger is immediate, a person might run or fight. If it's more remote, the reaction might be to freeze. Then, once consciousness kicks in, it becomes possible to counteract the brain's automatic response. You might freeze at the sight of an angry dog rushing toward you, then relax when you realize that it's on the other side of a fence.



Strength

TOM BOYLE JR.'s ability to lift a car might seem superhuman, but in fact it makes physiological sense.

Fine motor skills (used to thread a needle or put a key in a lock) tend to decline when we're under pressure. But gross motor skills (used to run or jump) peak much later, if at all: The closer a bear is nipping at your heels, the faster you'll run.

Penn State kinesiologist Vladimir

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Zatsiorsky has researched how stress affects the performance of weight lifters. He finds that when most of us try to lift a heavy object under ordinary circumstances, we can only use about 65 percent of our muscles' maximum theoretical strength. Trained weight lifters can do a bit better, achieving about 80 percent. In essence, we possess an automatic control system that limits the amount of strain we can put on our body's machinery, so that we don't injure ourselves unnecessarily.

But as the situation gets more critical, it may become worth risking some injury, so the limit lifts upwards. Under the pressure of competition, a trained weight lifter can heft up to an additional 12 percent.

There's a limit, however, to how fast and how strong fear can make us. We've all heard stories about panicked mothers lifting cars off their trapped babies. The tales have been circulating so widely, for so long, that a great many people I've talked to have sworn up and down that they must be true. Zatsiorsky's work, however, suggests that while fear can indeed motivate us to approach our absolute power level more than even the fiercest competition, there's simply no way to exceed it. A 100-pound woman who can lift 100 pounds at the gym might, according to Zatsiorsky, be able to lift 135 pounds in a frenzy of maternal fear. But she's not going to suddenly lift a 3,000-pound car.

How does the body unleash these reserves? The answer might lie in another, related aspect of the fear response: It deadens pain. Under acute stress the brain releases two kinds of chemicals, endocannabinoids and opioids; both are powerful analgesics. Their painkilling

effects override the aching feeling we normally get when we try to lift heavy weights.

Unfortunately, the effect is temporary. After Boyle went home, the painkilling properties wore off, and he realized that he'd clenched his jaw so hard while lifting the Camaro that he'd shattered eight teeth.



Focus

SOME 250 YEARS ago, the British wit Samuel Johnson took note of one of fear's most helpful but overlooked benefits—it helps shed distractions. “Depend upon it, sir,” he quipped, “when a man knows he is to be hanged in a fortnight, it concentrates his mind wonderfully.”

When an imminent threat appears, the subconscious mind takes matters in hand by narrowing attention to things that are really important. Deep within the midbrain, a small, primitive structure called the locus ceruleus sends out projections to widespread areas of the limbic system and the frontal cortex, releasing a potent neurotransmitter and hormone called norepinephrine—the brain's version of adrenaline. Norepinephrine causes the mind to be more alert and active when attention is essential.

Linda Hamilton is a psychologist who works with performers dealing with stage fright. A former dancer, she understands the horrible feeling of anxiety that can build while waiting for the curtain to go up. But she teaches her patients to embrace the positive aspects of that unpleasant mental state. “Anxiety is not all bad,” she says. “It's gearing you to rise to the occasion. Once you're on stage, you'll be right in the moment, and that's just where you need to be.”

Conversely, a performer who is too relaxed might find it hard to maintain focus. Hamilton once worked with a ballerina who had to dance for a group of donors. Since it wasn't an actual stage performance, she didn't feel the normal jitters beforehand. “She went out there completely relaxed, Hamilton recalls, “and it was the first time I ever saw her fall off her pirouettes and end up on her butt.”

Sometimes, then, the trick is to psych yourself up toward the top of the Yerkes-Dodson curve by frightening yourself. Daredevil Travis Pastrana says he uses it

before dangerous stunts. “When I'm not nervous, I'm not 100 percent focused,” he says. One recent caper involved jumping out of an airplane without a parachute, then hooking up with assistants in midair who strapped him into a chute. “When I jumped, the part that scared me the most was that I wasn't scared enough. I had to deliberately reset my laid-back mindset, which at that time was, ‘It's okay, Travis, you have the rest of your life to find those other jumpers and make this work.’”



Time Dilation

IDAHO BOWHUNTER Nolan Koller was sitting underneath a maple tree, hoping to see an elk, when his walkie-talkie crackled. “Dad,” came his son Jason's voice, “There's a bear cub coming right towards me.” A moment later, he radioed again: Another cub had appeared. And then, the mother.

Koller notched an arrow and hurried toward his son. “Dad, she's seen me now,” Jason called. “She's on me.” Koller sprinted. Fifteen yards from Jason's hiding place, he spotted the 200-pound black bear savagely clawing and biting his son. Koller shouted and waved his arms. The bear wheeled, saw him, and charged. There was no doubt what was on its mind. Koller drew back the bow, looking for a shot. The bear was moving in quick, but it seemed like it was moving in slow motion. He released the arrow. It found its mark, severing the bear's spinal cord. “I've never experienced anything like that,” says Koller. “Every energy I had was focused on placing that shot.”

The ability to seemingly slow down time is one of fear's strangest effects, yet one of the most commonly reported. Travis Pastrana says that when he rides his motorcycle off of a ramp, “a two-second jump can feel like twenty seconds.”

Neuroscientist David Eagleman of the Baylor College of Medicine investigated the phenomenon by creating a wristband that flashes numbers at a high rate of speed. An adjustment allows the display to be tuned so that the numbers flashed just a little bit faster than a subject can normally perceive. He wondered: In the grip of intense fear, would time actually slow down for someone wearing it, so that they could perceive the flashing num-

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bers? To answer the question, he arranged for volunteers to free-fall for 150 feet from an amusement park attraction called a "Suspended Air Catch Device."

It happens that, even in the terror of free fall, they couldn't read the numbers. So the brain doesn't really perceive time in shorter intervals, Eagleman concluded. Instead, he reasoned, it must create a more detailed memory of the event, so that in retrospect it seems like more things occurred. As it turns out, one of the brain regions stimulated by norepinephrine is the hippocampus, an important center for memory formation. "Essentially," Eagleman says, "when the amygdala is activated, the brain lays down really dense memories."

That's useful for survival. If we're ever again in a situation that threatens our lives in the same way, we'll want to remember what happened the first time around. And so memories of life-or-death crises remain vivid long after we've forgotten everything else that was going on at the time.



Fearlessness

PERHAPS THE MOST ironic aspect of fear is that when it's most intense, many people don't feel it at all. Pastrana says that he's often highly anxious before trying a new stunt, but that once his motorcycle is in motion, the feeling vanishes.

Bruce MacInnes was testing his Formula Ford race car on the track in Lime Rock, Connecticut on a sunny summer day when the left front pull rod separated. With a *bang!*, the car's belly pan crashed down onto the asphalt at 90 miles per hour. Trailing smoke and sparks, MacInnes slid downhill off the track, barreling straight toward a two-foot-high concrete retaining wall. No brakes, no steering, and impact just seconds away. He remembers thinking with absolute calm: "It's going to take my legs off."

Even though he'd never been in that kind of predicament before, he instantly knew what he had to do. He jammed the transmission into first gear and dropped the clutch. The Ford spun 180 degrees and skidded into the wall. The impact crumpled the machine, but it was the metal that took the brunt of the violence, not his body. As an emergency crew hosed

down the wreckage to prevent it from blowing up, MacInnes's crew chief pulled him from his harness. MacInnes walked away from a wreck that easily could have killed him. Not for another 10 minutes did he begin to feel the throbbing pain that told him he had broken his foot.

MacInnes' experience is one that survivors of life-and-death drama report again and again. When the moment of truth arrives, emotion vanishes. It's only later, when the threat has passed, that the knees go weak and the trembling begins.

"Emotions are useful when you're trying to make a valuation on something, when you're saying to yourself, 'What do I think about this? Does this feel good or bad?'" says Eagleman. "But in the situation where you're sliding toward a head-on collision, you know it's bad, so there's no point running that kind of stuff."

For those of us who might someday find ourselves facing intense danger, that's good to know. Though our fear circuitry can sometimes seem like a curse, it's designed to serve our interests. You could think of it as an alter ego that dwells secretly inside us, ever vigilant, ready to spring out when needed.

If you're ever under attack, remember that the fear circuitry can help us do things that would otherwise be impossible. Take comfort in that fact, and try to remain calm enough to take charge of the situation.

There is a bright side to crisis. The experience could give you a rare opportunity to meet a part of your mind you otherwise would never encounter—and to find out just how powerful you really are. ▀

JEFF WISE is the author of *Extreme Fear: The Science of Your Mind in Danger*.

