

degenerate gas; if Cooper pairs were present, the binding energy of the pairs should show up clearly. Neither group saw such signs of Cooper pairs, but both uncovered useful new details of how fermionic atoms interact near a Feshbach resonance.

Several teams have recently studied the formation of loosely bound two-atom molecules

in their gases. “We hope that we can turn [the molecules] into Cooper pairs,” Ketterle says. And in August theorist Yvan Castin and his co-workers at the École Normale Supérieure suggested just how that might be done: first let the molecules Bose-condense, then adjust the Feshbach resonance. If that is true, experimenters are just two steps from their goal.

HEALTH

## Musical Medicine

A HIGH-TECH PIANO TREATS A REPETITIVE STRESS DISORDER BY W. WAYT GIBBS

### IT GETS STUCK IN YOUR HEAD

The stress injury called dystonia appears to originate in the brain, not the muscles. “If you do an MRI on someone with focal dystonia,” says Edgar E. Coons of the Center for Neural Science at New York University, “you see a change in the parts of the brain that receive touch and motor feedback for each finger. Those zones are normally physically separated in the brain.

But in people with dystonia, the regions merge.” Curiously, the cramping and rigidity of focal dystonia often disappear during everyday activities but resurface as soon as the musician starts to play.



**PIANO ROLL** of author's performance shows notes that are inconsistent in spacing and duration (top) and subsequent improvement (bottom).

**M**y left forearm twinges as I sit down at Kathleen M. Riley's piano. An hour of scribbling notes and two days of working on a laptop computer have inflamed my repetitive stress injury, an ailment common among journalists—and musicians. In fact, hardworking musicians can develop a much more severe condition, known as focal dystonia, which cramps the hands so badly that it often ends a promising career. Injections of botulinum toxin can relieve dystonia for some, but the effect lasts only a couple of months.

I never had a career at the piano. But I have played Haydn's Sonata No. 50 more than 100 times over the past 20 years and at one point had even committed much of it to memory. What is unnerving me, in part, is the computer attached to the Yamaha Disklavier piano that will record just how I touch each key. Also unsettling are Riley's refereelike gaze and the video camera trained on my left hand. But mainly my trepidation is fed by a gloomy certainty that that sore hand will lag through the opening bars. As indeed it does: what should be a quiet, perfectly even motif of sixteenth notes comes out as a skewed, off-tempo jangle.

Riley, a music technologist and dystonia therapist at New York University, can help. By linking the instrumented instrument with software and a precisely synchronized video recording, she has turned the piano into a

medical machine. The system captures the time and velocity at which each note is struck and released. Even more important, it captures the position of the performer's hands, arms and body. Bad habits—slouching, angled wrists, rigid forearms, raised elbows—can over years of playing contribute to focal dystonia.

“Athletes are coached about how to hold and move their bodies,” Riley says. “But musicians rarely get that kind of instruction from their teachers. And unlike athletes, musicians tend not to warm up before practicing, take breaks to rest, or stretch out afterward.” Riley, who so far has helped five musicians ease their dystonia, uses the computer's “piano roll” display of a performance to detect which fingers are cramping in certain passages. The synchronized video reveals unhealthy postures and overly tense muscles. Riley then coaches the musician to play in ways that allay the cramps.

After a minute of the Haydn sonata, for example, she stops me and rewinds the video. As the Disklavier replays my performance—the keys moving themselves, ghostly—she points to the monitor. “See how your left wrist drops?” It is half an inch lower than my right wrist, forcing the left hand to cock upward and its fingers to flatten. “Also, you are sitting much too close,” she says. “Your left elbow and wrist are locked, so your forearm is full of tension.”

Riley has me move the bench six inches, arch my back to shift forward my center of gravity, and straighten and raise my wrists so that the piano keys, rather than my sore joints, bear the weight of my arms. I play the passage again, and she brings up both record-



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ings on the laptop screen for comparison.

Blocks represent each note: the size of each block shows the note's duration; color indicates the velocity with which it was struck. After coaching, the notes are much more even and overlap slightly with one another, producing the desired legato sound. Note velocities, which initially ranged wildly from 32 to 62 (in arbitrary MIDI units), now all cluster close to 40.

Of course, it can take months or years to break bad habits developed over decades. But at least now there is a good tool for those who must try, in order to save their career. And the therapy may ease other kinds of repetitive stress injuries, Riley says. "One girl I worked with took what she learned at the piano and applied it to her typing and mousing. It relieved her carpal tunnel syndrome."

MEDICINE

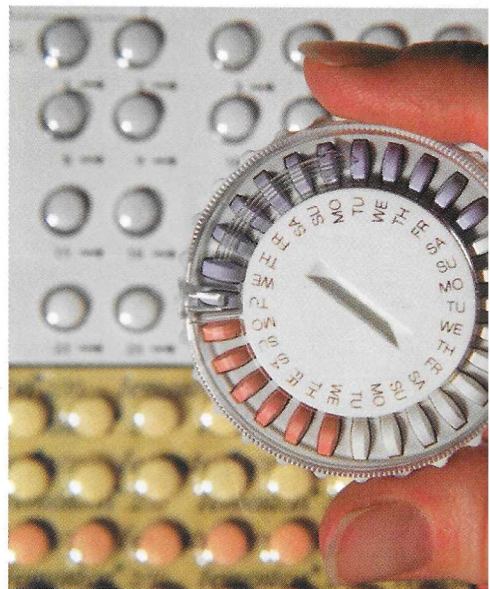
## Hormone Hysteria?

HORMONE REPLACEMENT THERAPY MAY NOT BE SO BAD BY DENNIS WATKINS

**P**ostmenopausal women have for decades relied on estrogen supplements to control the hot flashes, memory loss, osteoporosis and other ailments that can occur when their bodies no longer produce the compound. But hormone replacement therapy (HRT) is no longer considered the best way to treat menopause, ever since a report last year found that women receiving a certain type of HRT were at increased risk for dangerous side effects, such as breast cancer. Many health professionals have concluded that altering a woman's physiology will always increase risks over time. But a handful of respected scientists are calling for another look at HRT, arguing that not all therapies are created equal.

The largest blow to HRT appeared in the July 17, 2002, *Journal of the American Medical Association*. It presented important results of the Women's Health Initiative's long-term study of more than 16,000 women taking estrogen and a progesterone derivative. The study was halted prematurely, the authors reported, because too many women were encountering serious medical problems. "I believe that the drug we studied has more harms than benefits when used for the prevention of chronic diseases such as osteoporosis in generally healthy women," notes Jacques Rossouw, project officer of the initiative. In the past year a steady cascade of articles has enumerated all the

higher risks that patients in the study experienced: an 81 percent increase in heart disease in the first year of therapy, a 24 percent increase in invasive breast cancer



**SAFETY OF DAILY DOSES** of hormones for menopausal women may depend on the particular type of hormone combination used.

and a 31 percent increase in stroke. The therapy also doubled the risk of dementia. (A study of more than 800,000 women published in *Lancet* on August 9 also found an increased risk of breast cancer in postmenopausal women receiving a wide variety of HRT but noted that the risk of mortality from breast cancer related to HRT could not be determined.)