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Neuroscience just got faster, cheaper and easier

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Richard Gershon has a shiny new toolbox for neuroscientists that will revolutionize their clinical research by making it radically faster, cheaper and more accurate. It also will help researchers recruit children and adults for studies because participation will be much less time consuming.

On Sept. 10 and 11, Gershon will introduce the new NIH Toolbox to hundreds of researchers at a special National Institutes of Health (NIH) conference in Bethesda, Maryland. At the end of September, he will give away the tools for free to NIH researchers.

Gershon, an associate professor of medical social sciences at Northwestern University Feinberg School of Medicine, has led an ambitious six-year NIH-funded study reflecting the efforts of 235 scientists around the world that provides the first common measurements for neurological and behavioral health. Currently, one researcher's test to measure depression, for example, isn't the same as another's, so their study results aren't comparable. Research is built on others' findings so this hodgepodge mires progress.

The 44 new tests —- available in Spanish and English —- slash the number of questions and time required for study participants by up to 90 percent. The tests also are royalty-free (other tests often have expensive royalties that hike the cost of research) and can be administered by anyone with a basic college education, a less expensive alternative to the Ph.D. level-person with specialized training now required to administer

them.

An intelligence test that normally takes three hours is whipped off 30 in minutes with the new NIH Toolbox version. Many traditional "gold standard" tests are trimmed from 30 items to five. Every new test was validated to make sure it yields comparable or better results than the longer ones.

Many of the streamlined tests are accomplished through computer adaptive testing –- Gershon's expertise. In this approach, the computer is constantly adjusting the questions to meet the level of the person being tested, eliminating lots of extraneous questions.

"With the computer we cut to what we need to measure in each individual person," Gershon said. "We zero in on that person's individual level of functioning and don't waste their time asking questions far above or below their ability."

Scientists collected data from more than 20,000 participants to determine the difficulty level of every item and validate those items against "gold standard" measures.

This is how it works. In a vocabulary test administered to a third grader, the first item will be third grade level. If the student gets that correct, the next one will be 3.5 level and so forth until the computer has zeroed in on the student's precise ability level. The test only has 20 vocabulary questions compared to the traditional 50 items, but the shorter test is more reliable because half the items on the traditional test would be below the student's ability and half would be above it.

The shortened tests will aid a longitudinal study like the 100,000-subject National Children's Study, which can spend only so much time testing each child. "Even if we can only test a child for one hour every year we

now can administer up to 20 tests during that hour and accurately track his or her development," Gershon said.

The new tests also are the first to measure a continuum of health from dysfunction through superfunction in neurological and behavioral health for persons ages 3 to 85. Most existing tests were developed to measure dysfunction A benefit of the continuum is being able to identify —- in longitudinal studies, epidemiological studies and clinical trials —- where problems begin to emerge and what the causes may be. To develop norms for the continuum, researchers measured a sample of 5,000 people in English and Spanish of various races and ethnicities of every age in 10 different data collection sites around the country.

Gershon tapped the top scientists in the country in each domain to develop the new tests. For the olfaction measure, eight top researchers conferred to examine the worldwide inventory of smell tests and eventually designed their own. The NIH version costs $2 a person (to pay for the scratch and sniff cards) compared to the gold standard tests, which are available for $15 to $30.

In addition to smell, some of the measures include multiple areas of cognition, emotional health and motor and sensory functioning such as vision and hearing.

More than 30 Northwestern scientists and staff members were involved in the NIH Toolbox including David Cella, chair of medical social sciences, and senior researchers Sandra Weintraub, William Rymer, Nina Kraus and Steve Zecker.

Provided by Northwestern University