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A Sharper Mind, Middle Age and Beyond

By **PATRICIA COHEN**

IN 1905, at age 55, Sir William Osler, the most influential physician of his era, decided to retire from the medical faculty of Johns Hopkins. In a farewell speech, Osler [talked about the link](#) between age and accomplishment: The “effective, moving, vitalizing work of the world is done between the ages of 25 and 40 — these 15 golden years of plenty.”

In comparison, he noted, “men above 40 years of age” are useless. As for those over 60, there would be an “incalculable benefit” in “commercial, political and professional life, if, as a matter of course, men stopped work at this age.”

Although such views did not prevent the doctor from going on to accept a post at Oxford University, one he retained until his death at age 70, his contention that brainpower, creativity and innovation have an early expiration date was, unfortunately, widely accepted by others. Until recently, neurologists believed that brain cells died off without being replaced. Psychologists affirmed the supposition by maintaining that the ability to learn trudged steadfastly downward through the years.

Of course, certain capabilities fall off as you approach 50. Memories of where you left the keys or parked the car mysteriously vanish. Words suddenly go into hiding as you struggle to remember the guy, you know, in that movie, what was it called? And calculating the tip on your dinner check seems to take longer than it used to.

Yet it is also true that there is no preordained march toward senescence.

Some people are much better than their peers at delaying age-related declines in [memory](#) and calculating speed. What researchers want to know is why. Why does your 70-year-old neighbor score half her age on a memory test, while you, at 40, have the memory of a senior citizen? If investigators could better detect what protects one person’s mental strengths or chips away at another’s, then perhaps they could devise a program to halt or reverse decline and even shore up improvements.

As it turns out, one essential element of mental fitness has already been identified. “Education seems to be an elixir that can bring us a healthy body and mind throughout adulthood and even a longer life,” says Margie E. Lachman, a psychologist at Brandeis University who specializes in aging. For those in midlife and beyond, a college degree appears to slow the brain’s aging process by up to a decade, adding a new twist to the cost-benefit analysis of higher education — for young students as well as those thinking about returning to school.

Dr. Lachman is one of the principal investigators for what could be considered the Manhattan Project of middle age, an [enormous study](#) titled *Midlife in the United States*, or *Midus*. This continuing examination of Americans' physical and emotional health and habits gained momentum in the 1990s as the first wave of baby boomers were settling into their fifth decade and running up against their own biases against aging. More than 7,000 people 25 to 74 years old were drafted to participate so that middle-agers could be compared with those younger and older. And with a new \$21 million grant from the National Institute on Aging, the *Midus* team is beginning its third round of research this month.

What makes *Midus* particularly valuable is that researchers can track the same person over a long period, comparing the older self with the younger self to see which capabilities are declining and which are improving. This approach has opened a new peephole into the middle-age brain.

DESPITE continuing emphasis on SAT-type testing, in recent decades researchers have become much more aware of the range of abilities that constitute intellectual muscle. The Harvard psychologist Howard Gardner called his version of this theory "multiple intelligences" in his seminal 1983 book, "Frames of Mind." "The human mind," he later explained, "is better thought of as a series of relatively separate faculties, with only loose and non-predictable relations with one another, than as a single, all-purpose machine that performs steadily at a certain horsepower, independent of content and context."

Many researchers believe that human intelligence or brainpower consists of dozens of assorted cognitive skills, which they commonly divide into two categories. One bunch falls under the heading "fluid intelligence," the abilities that produce solutions not based on experience, like pattern recognition, working memory and abstract thinking, the kind of intelligence tested on I.Q. examinations. These abilities tend to peak in one's 20s.

"Crystallized intelligence," by contrast, generally refers to skills that are acquired through experience and education, like verbal ability, inductive reasoning and judgment. While fluid intelligence is often considered largely a product of [genetics](#), crystallized intelligence is much more dependent on a bouquet of influences, including personality, motivation, opportunity and culture.

To illustrate how crystallized intelligence can operate, [Gene D. Cohen](#), a founder of the field of geriatric [psychiatry](#), related a story about his in-laws from his book "The Mature Mind: The Positive Power of the Aging Brain." The couple, in their 70s, arrived in Washington for a visit during a snowstorm and found themselves stranded by the train station. When they saw a pizzeria across the street, his father-in-law had an idea. The couple went inside, ordered a pizza to be delivered to their daughter's house, and then asked if they could ride along.

As Cohen explained, one of the brain's most powerful tools is its ability to quickly scan a vast storehouse of templates for relevant information and past experience to come up with a novel solution to a problem. In this context, the mature brain is especially well equipped, which is probably why we still associate wisdom with age.

Indeed, mental capabilities that depend most heavily on accumulated knowledge and experience, like settling disputes and enlarging one's vocabulary, clearly get better over time. If you're looking for someone to manage your financial portfolio, you might be better off with a middle-ager than a fresh young M.B.A.

Richard E. Nisbett, a cognitive psychologist at the University of Michigan, has long argued that when it comes to intelligence, experience can outrun biology. A [recent study](#) he wrote with Igor Grossmann on aging and wisdom concluded: "Older people make more use of higher-order reasoning schemes that emphasize the need for multiple perspectives, allow for compromise, and recognize the limits of knowledge." Most important, they discovered that despite a decline in fluid intelligence, complicated reasoning that relates to people, moral issues or political institutions improved with age.

Dr. Lachman and one of her colleagues at Brandeis, Patricia A. Tun, have been buoyed by the news about crystallized intelligence. But they wanted to know whether anything could be done to halt the seemingly steady decline of fluid intellectual skills through the years. So they devised several quick memory, calculation and reasoning tests that could be easily administered to thousands of the Midus participants. For example: to check verbal memory, they recited 15 common words. After 90 seconds, they asked a subject to list as many of the words as possible.

To test numerical reasoning, they asked participants to discern the pattern in a sequence: What comes next in the series 18, 20, 24, 30, 38? Their team also tested reaction time by evaluating how quickly someone responded to a change in instructions. Here the subject was instructed to say "Go" when the interviewer said "Green," and "Stop" when she said "Red." Then the instructions were reversed, requiring the subject to say "Stop" in response to "Green" and "Go" in response to "Red." At the end of the survey, the researcher once again asked how many of the 15 words the subject could remember.

(For those trying this at home, the answer to the numerical sequence is 48.)

The results varied in expected and unexpected ways. As anticipated, people over 50 performed worse on speed and memory challenges than their younger counterparts. The aging brain was more easily distracted and slower in retrieving information; it had trouble shushing internal chatter and preventing stray thoughts from interfering with concentration. Women tended to do better than men when it came to recalling the list of words, while men were better at picking out number patterns and reacting quickly to changing instructions.

The most consistent results involved education.

All other things being equal, the more years of school a subject had, the better he or she performed on every mental test. Up to age 75, the studies showed, "people with college degrees performed on complex tasks like less-educated individuals who were 10 years younger."

Education was also associated with a longer life and decreased risk of [dementia](#). "The effects of education are dramatic and long term," Dr. Lachman says.

To isolate the specific impact of schooling on mental skills, Dr. Lachman and her colleagues tried to control for other likely reasons one person might outshine another — differences in income, parental achievement, gender, [physical activity](#) and age. After all, we know that the children of affluent, educated parents have a raft of advantages that could account for greater mental heft down the road. College graduates are able to compound their advantages because they can pour more resources into their minds and bodies.

Still, when Dr. Lachman and Dr. Tun reviewed the results, they were surprised to discover that into middle age and beyond, people could make up for educational disadvantages encountered earlier in life. Everyone in the study who regularly did more to challenge their brains — reading, writing, attending lectures or completing word puzzles — did better on fluid intelligence tests than their counterparts who did less.

And those with the fewest years of schooling showed the largest benefits. Middle-age subjects who had left school early but began working on keeping their minds sharp had substantially better memory and faster calculating skills than those who did not. They responded as well as people up to 10 years younger. In fact, their scores were comparable to college graduates.

“We have shown that those with less education may be able to compensate and look more like those who have higher education by adopting some of the common practices of the highly educated,” Dr. Lachman says.

Regular mental workouts can actually alter the brain’s neural circuits in middle-age and older adults, making regions like the hippocampus, a center for memory and learning, more responsive. Cognitive exercise also helped improve executive functioning, the kind of decision-making ability associated with a mission control center.

In another study, Dr. Lachman showed that adults, particularly men, with low levels of education could also improve mental function by using a computer. Although researchers are not sure why, they speculate that computers required users to switch mental gears more frequently or process information in a new way, which quickened reaction time. (Research on computer use by highly educated adults has produced much more mixed results.)

When the Midus team put their data together, they noticed other similarities among people with the strongest cognitive skills. Senior citizens who performed as well as younger adults in fluid intelligence tended to share four characteristics in addition to having a college degree and regularly engaging in mental workouts: they exercised frequently; they were socially active, frequently seeing friends and family, volunteering or attending meetings; they were better at remaining calm in the face of stress; and they felt more in control of their lives.

Just as money and education often run together, these factors tend to reinforce one another. Adults who call on friends and family for support may be better able to reduce their stress, and reducing their stress may give them sense of control.

Dr. Lachman emphasizes that there is still a lot more research to do before the connections between education and cognitive ability as people age is fully understood. Still, she says: “When young adults think

about college, they think about career opportunities and possibly the social benefits. What they don't realize is college education has long-term benefits well beyond first job and social contacts." The same could be said for continuing education.

At a time when the prospect of a longer life is shadowed by the fear of mental decline, the possibility that the aging can have some control over their mental fitness is an idea even William Osler would support.

Editors' Note: This article has been revised to remove a list of the specific words in a memory test, which continues to be used in current research.

Patricia Cohen is a reporter for The Times and author of "In Our Prime: The Invention of Middle Age," published this month by Scribner.