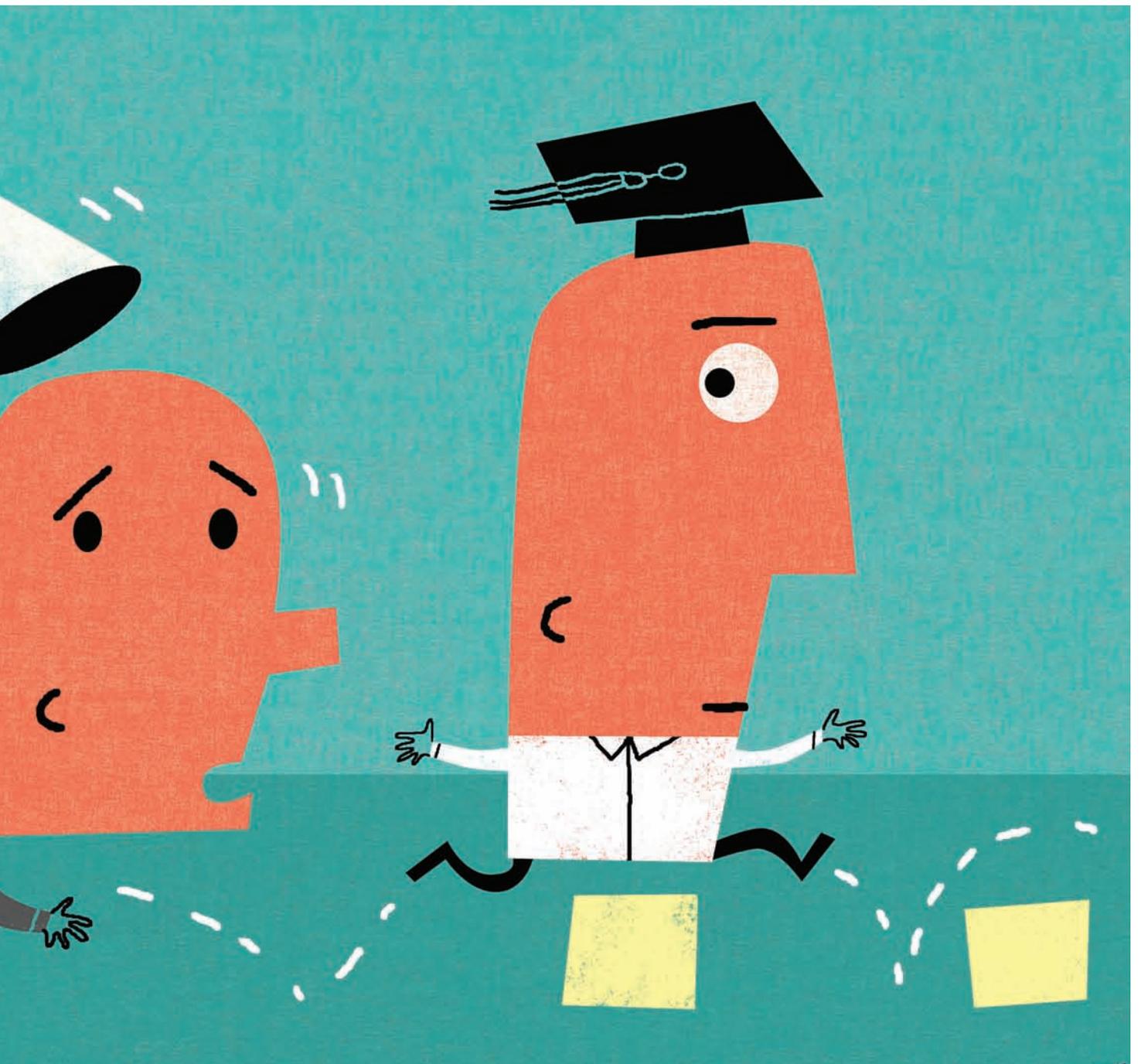




Outsmarting

Your intelligence affects your life span in several surprising ways



Mortality

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As Benjamin Franklin once wrote, “In this world nothing can be said to be certain, except death and taxes.” Although some of us are clearly better than others at dodging the inevitable, in the end Mother Nature at least will always win. But along the path of life, people vary

greatly in how often they get injured, incur illness or coast along in a comfortable state of health.

Considered at a distance, genetics and luck seem to explain a lot. But if we really understood why some people live longer than others, we would likely have diminished the gap by now. When epidemiologists and physicians discover some lifestyle choice or biological factor that leads to a longer and healthier life, they can then attempt to design intervention programs to ameliorate the health prospects of the population as a whole.

Some habits such as cigarette smoking have been identified as bad, but in general the search for answers has proved difficult. The reason is that every single one of us begins our journey through life with unique biological and environmental circumstances and then proceeds to make an uncountable number of lifestyle

choices, any of which may or may not impact health. No study can take every factor into account—all the people in the world are not enough to run investigations of this scale.

In recent years research psychologists, including two of us (Weiss and Deary), have joined physicians and epidemiologists, such as one of us (Batty), in the search for predictors of well-being, illness and death. We often use data from health studies that span several decades. In these projects, hundreds, thousands or sometimes even a million individuals are regularly checked and examined over the course of many years. By sifting through such data, we and other researchers in this area have uncovered a new predictor of how long people live: the scores they obtain on an intelligence test when they are at a young age.

The findings are unequivocal, al-

though few health practitioners are aware of them. The lower a person’s measured intelligence, the greater that individual’s risk of living a shorter time, developing both mental and physical ailments later in life and dying from cardiovascular disease, suicide or an accident. More surprising still is that low intelligence is a stronger predictor than several better-known risk factors for illness and death, such as obesity and high blood pressure.

Having found this unexpected facet of longevity, we had to ask why it exists. We and other researchers tried to explore whether factors other than intelligence might underlie our findings, such as people’s socioeconomic status, education levels and employment. Scientists have already established that people who are less educated, work in manual rather than professional jobs, or have lower incomes suffer from more illnesses and tend to die earlier. So you could easily suppose, for example, that intelligent youngsters get more education, learn more about health through their schooling and thus live longer.

Indeed, the predictive power of intelligence for health and death diminishes after we control for the level of people’s schooling. But testing these possibilities is not as straightforward as it might sound. Think of it this way: intelligence affects how well we do in school, so education levels might, in fact, just be a rough measure of intelligence.

For the sake of making the strongest argument possible, however, our work

FAST FACTS

Healthy Brains, Healthy Bodies

- 1>> Large population studies have revealed strong links between intelligence and both mental and physical health.
- 2>> Lower scores on intelligence tests correlate with higher risk of developing personality disorders, depression and several types of cardiovascular disease, among other illnesses.
- 3>> By acknowledging the role of intelligence in health disparities, public health specialists can intervene to help close the gap.



and studies by others treat education, socioeconomic status and similar factors separately. Our initial observation held—the magnitude of a person’s measured intelligence still links up with a range of health outcomes.

If we can tease out the role of intelligence in health disparities, we might find ways to improve society’s overall well-being. The eventual aim of this type of research, called cognitive epidemiology, is to reduce health inequalities across a population. To the extent that it is possible, cognitive epidemiologists want to help people maintain the best possible health throughout life regardless of how they perform on a handful of tests.

The Nature of Intelligence

For more than a century, psychologists have argued whether intelligence

consists of many independent mental abilities or whether it is instead a single property that each of us possesses to one degree or another.

Our everyday experience offers some support for both interpretations. We all know people who seem to have obvious cognitive strengths and weaknesses. They may, for example, be poor at verbal reasoning but excellent at working out mathematical problems in their head. Or they might perform well at both these tasks and also excel—or fail—when confronted with a different set of mental challenges. But the data tell us a different story.

In 1904 British psychologist Charles Spearman discovered that if you test a group of people on a wide range of mental abilities, the scores form a clear pattern: subjects who do well on one type of

cognitive task tend to do well on all the others. He called this phenomenon general intelligence, a term usually shortened to *g*. Countless studies using myriad mental tests have replicated this finding again and again. General intelligence is a fact of human existence.

It is not, however, the only component of smarts. Although *g* explains most of the differences underlying mental performance, the brain also recruits specific cognitive skills to carry out a task. People differ in three types of capability—general intelligence, broad domains of mental performance, and specific abilities. Unlike many things in life, here we can have things both ways: the idea of general intelligence is correct, but it is not the only key to being bright.

With respect to health, *g* is the aspect of intelligence that matters. How well



we rate in *g* remains very stable across our lifetime. It also acts as a good predictor of a person's success in a wide range of domains, including employment, education, social life and everyday practical decision making. In data sets with tens of thousands of participants in England, intelligence at age 11 very strongly predicted performance in national school exams five years later. Later in life, social mobility and income also appeared tied to *g*.

Linking Intelligence and Health

Over a lifetime most human brains function reasonably smoothly: they pro-

cess sensory information correctly, carry on social interactions and react appropriately to life's ups and downs. A small but significant percentage of individuals, however, will experience some form of mental illness.

Dozens of studies indicate that low intelligence is a slight, early indicator of a person's chances of developing a mental illness. One scientific report found that British children with lower intelligence scores at age 10 or 11 were more likely to say they had experienced psychological distress in early adulthood than their higher-performing counterparts. By middle age these same individuals were at a greater risk of hospital admission for any psychological disorder.

Another study followed a selection of Swedish schoolchildren for more than three decades. Children who tested lower in intelligence developed personality disorders once they reached adulthood more frequently than those with better scores. Research on a group known as the Vietnam Experience Study cohort confirmed the trends and also examined

the reverse direction—it found that individuals suffering from more than one psychiatric problem had by and large fared poorly on intelligence tests.

Even more evidence comes from a survey of nearly one million Scandinavian men who were conscripted into national military service. Lower intelligence at around age 20 was associated with a greater risk of suffering by midlife from several psychiatric disorders that warranted inpatient care. These illnesses included schizophrenia, mood disorders such as major depressive episodes, and alcohol-related problems.

Lower intelligence also appears to magnify the risk of coming to physical harm, as the investigators studying the Swedish military conscripts found. The enlistees with lower intelligence-test scores were more likely to die of suicide; homicide mortality followed the same pattern. This surprising finding prompted the researchers to explore the link between intelligence and hospitalization for assault. Indeed, more intelligent men were less likely to experience an attack

>> MORE SCIENCE See the *Psychological Science in the Public Interest* article, "Intelligence and Personality as Predictors of Illness and Death: How Researchers in Differential Psychology and Chronic Disease Epidemiology Are Collaborating to Understand and Address Health Inequalities," on which this story for *Scientific American Mind* is based, at the Association for Psychological Science's Web site: www.psychologicalscience.org

of any description. Likewise, the risk of being involved in a fight or brawl was more than eight times as great for the least versus the most intelligent members of the group. Data on unintentional injuries such as those received in traffic accidents also matched this trend, with a doubling of risk for individuals at the lower end of the intelligence range as compared with those at the top.

At first we struggled to come up with a convincing theory that could tie together all these varied outcomes. We derived one clue from a finding common to the studies. The connection between intelligence and all of the end points we just discussed is graded. That is, the difference in risk does not kick in just for below-average or very low intelligence-test scores. Instead the risk grows gradually as intelligence decreases.

Let us start by looking at how this point can help us flag the various causes contributing to mental illness. If we had seen the impact of intelligence on health only for people with the lowest scores, we might have supposed that sometimes the intelligence tests were reflecting undetected neurodevelopmental problems. Although that interpretation might explain some cases, now we can hypothesize that a subset of the population may be at an early stage of some psychiatric disorder that is reducing their intelligence, such that as the disease progresses, intelligence declines further.

A link between low intelligence and mental illness may also explain the suicide risk that researchers have observed. Conditions such as depression greatly increase the chances that a person will commit suicide. That risk may be aggravated by the possibility that lower intelligence limits an individual's capacity to resolve problems or personal crises, and suicide is thought of more prominently as a solution. Such speculations remain to be tested, however.

As for the connection between intelligence and both assault and homicide, researchers have put forward a number

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of hypotheses. We know that people with lower intelligence tend to be at a socioeconomic disadvantage. Therefore, the risks they encounter might simply reflect the downsides of living in poorer, more dangerous neighborhoods. Alternatively, the effects might emerge from differences in a person's ability to perceive risk; people who are higher in intelligence might be more aware of their surroundings and less likely to, say, take shortcuts through dark alleyways.

A third possibility, based on the fact that intelligence is strongly related to verbal skills and reasoning, is that people who are less intelligent might not be adept at ending arguments by "jaw-jaw" rather than "war-war," to paraphrase Winston Churchill. As for the statistics on unintentional injury, lower intelligence might signal a fuzzier perception of risk or slower reaction times, both of

which track with intelligence. An accurate appraisal of a risky situation and speedy reactions certainly seem like useful things in avoiding accidents.

From Brainpower to Blood Flow

Later in life, low intelligence-test scores continue to have strong implications for an individual's health. The studies described earlier assessed mental health no later than middle age. They did not explore the various forms of dementia that typically occur in older age. With a demographic shift toward a more elderly population and an absence of successful treatments, understanding the causes of dementia and identifying it early are crucial to minimizing its impact.

In 2008 researchers had the rare opportunity to investigate whether intelligence can also predict dementia. They followed up on a landmark study known as the Scottish Mental Survey of 1932, which tested the intelligence of almost all children born in 1921 and attending school in Scotland on June 1, 1932. It tested 87,498 children—about 95 percent of the target population. The scientists reported that having a lower score on a childhood intelligence test was a risk factor for late-onset vascular dementia but not Alzheimer's-type dementia.

Here we find another important clue. Vascular dementia and Alzheimer's disease manifest themselves with similar symptoms—in both disorders, patients show severe cognitive impairment. But unlike Alzheimer's, the causes of vascular dementia are more closely tied to physical health: diabetes, cardiovascular disease and hypertension are all risk factors. The finding from the Scottish survey suggests that the pathway between early-life intelligence and later cognitive decline in-

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volves vascular processes—the body’s ability to effectively circulate the blood—rather than, say, a person’s mental resilience to brain damage.

In fact, several studies have linked lower intelligence, as measured during the participants’ youth, with later cardiovascular disease, an umbrella term that encompasses coronary heart disease and stroke. In Western populations that are middle-aged and older, the most common cause of death and disability is cardiovascular disease. Coronary heart disease in particular is the leading killer in the U.S. It occurs when fatty deposits block the coronary arteries that supply blood to the heart. If blockage takes place, heart muscles die and the person has a heart attack.

The most likely explanation for the role of intelligence in predicting cardio-

vascular disease is a straightforward one. Across the board, lower intelligence appears to be related to lifestyle choices that harm health. Cigarette smoking, excessive alcohol consumption or alcohol abuse, physical inactivity and poor diet—all of which likely elevate the risk of cardiovascular disease—are more common in men and women whose scores on intelligence tests in childhood and early adulthood are lower.

These health-impairing habits may also have further physiological consequences—namely, the metabolic syndrome. This illness describes a combination of characteristics related to diabetes and cardiovascular disease risk: abdominal obesity and higher body mass index, fasting glucose, triglyceride levels and blood pressure. In layman’s terms, think of it as having a beer belly, weighing too

much for your height and coping with high blood sugar and elevated cholesterol. A 2008 study found that the metabolic syndrome explained about one third of the now reasonably well-established association between intelligence and death from cardiovascular disease.

Deciphering the Data

These findings begin to paint a picture of how higher intelligence may better equip some people to stave off poorer physical health and earlier death. But researchers in cognitive epidemiology still strive to integrate the data to form a broader scientific story of how thinking power relates to illness.

One possible narrative is known as the system-integrity hypothesis—basically that differences in our bodies are to blame. The idea is that intelligence tests

not only reflect the efficiency with which a brain operates but also indicate more generally a well-put-together body, one that is best prepared to respond to life's challenges. Measures of a person's reaction times, and therefore the information-processing efficiency of that person's brain, also appear to predict longevity. Faster reaction times mean longer life.

In fact, if we control for reaction time, the effect of intelligence is no longer a predictor of mortality at all. If a brain's processing speed reflects the overall integrity of the nervous system—and possibly a good physical composition—we might have another possible explanation for the connections we see with cardiovascular disease, vascular dementia and such seemingly unrelated phenomena as accidental injury. But without a full understanding of why intelligence and reaction times correlate so strongly, interpreting the mechanisms remains a guessing game.

Another possibility is that we are observing the powerful effects of the environments in which we live. As we noted earlier, higher intelligence scores are associated with both educational success and socioeconomic achievement. People who perform less well on intelligence tests tend to occupy lower socioeconomic rungs. As a result, these individuals may face a lifetime of additional challenges and stressors—as well as a greater risk of becoming the victim of a crime—that their more intelligent counterparts simply do not encounter.

Whether one road or many connect our respective intelligences to our longevity, the numerous health-related choices we make in our lifetimes may well pave them all. Should I try smoking? Do I see my doctor about this funny feeling in my chest? Do I take a taxi or bus home at night, or do I brave walking through a rough neighborhood? More intelligent individuals may be making better choices that promote well-being and an extended life.

Naturally, anywhere between none

The pathway connecting early-life intelligence and later mental decline appears to involve the body's ability to circulate its blood.

and all these hypothetical scenarios may explain the connection we have been describing. More possibilities probably exist. What is important is that this research has provided valuable insights and brought out new ideas that future experiments can test. But only by studying people across long periods can we amplify what we have learned so far.

Why It Matters

Studies of twins and other genetic relatives have shown that genes play a major role in determining just how intelligent you are. But we think that knowing more about the impact of intelligence opens up the possibility of improving and maintaining the health of individuals across all ability levels.

For example, as with patients who have a family history of cardiovascular disease, patients lower in intelligence could be advised to have their heart's health monitored more regularly. If research establishes that people with lower intelligence are less likely to receive adequate screening, comply with medication regimens and have follow-up examinations, special efforts could be made to engage them in such activities.

Because several highly reliable and valid measures of intelligence for younger age groups exist, health care professionals and teachers might be able to intervene early on and help individuals make more health-promoting decisions. We can also use this information to tailor educational programs for kids across a range of abilities.

Finally, teaching all children and adults, regardless of intelligence, techniques for maintaining a healthy lifestyle, developing nutritious eating habits and avoiding stressors could minimize the overall accumulation of cellular defects that impinge on longevity and long-term mental functioning. Indeed, the findings of cognitive epidemiologists such as ourselves bolster what all of us have known all along—that instilling good habits and healthy behaviors may lead to a lifetime of protection from the ravages of age. We emphasize, too, that *being* intelligent may not be the key ingredient for longevity. Instead *acting* and *deciding* as intelligent people do may be the crucial factor. For cognitive epidemiologists—and anybody else concerned with health—this distinction is a liberating thought. **M**

(Further Reading)

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