Intelligence Predicts Health and Longevity, but Why?

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Abstract
Large epidemiological studies of almost an entire population in Scotland have found that intelligence (as measured by an IQ-type test) in childhood predicts substantial differences in adult morbidity and mortality, including deaths from cancers and cardiovascular diseases. These relations remain significant after controlling for socioeconomic variables. One possible, partial explanation of these results is that intelligence enhances individuals' care of their own health because it represents learning, reasoning, and problem-solving skills useful in preventing chronic disease and accidental injury and in adhering to complex treatment regimens.

Keywords
intelligence; health; longevity

Health psychologists examine the impact of volition on health, but might not competence matter too? Managing one's physical health is, after all, one of life's jobs, and personnel psychology has established that psychometric intelligence, that is, intelligence as measured by IQ tests, is the best single predictor of job performance. Indeed, intelligence is the best single predictor of major socioeconomic outcomes, both favorable (good education, occupation, income) and unfavorable (adult poverty, incarceration, chronic welfare use; Gottfredson, 2002).

HOW WELL DOES EARLY INTELLIGENCE PREDICT LATER HEALTH AND LONGEVITY?

Intelligence has been linked with various health behaviors and outcomes. On the positive side, physical fitness, a preference for low-sugar and low-fat diets, and longevity increase with higher intelligence; on the negative side, alcoholism, infant mortality, smoking, and obesity increase with lower intelligence (Gottfredson, in press). Especially informative are two epidemiological studies correlating IQ in childhood to adult morbidity and mortality.

Australian Veterans Health Studies

O'Toole and Stankov (1992) used IQ at induction into the military, along with 56 other psychological, behavioral, health, and demographic variables, to predict noncombat deaths by age 40 among 2,309 Australian veterans. When all other variables were statistically controlled, each additional IQ point predicted a 1% decrease in risk of death. Also, IQ was the best predictor of the major cause of death, motor vehicle accidents. Vehicular death rates doubled and then tripled at successively lower IQ ranges (100-115, 85-100, 80-85; O'Toole, 1990).

Scottish Mental Survey 1932 (SMS1932)

To date, Scotland is the only country to have conducted IQ testing on almost a whole year-of-birth cohort. This took place in the remarkable Scottish Mental Survey of 1932 (SMS1932). On June 1, 1932, a version of the Moray House Test (MHT) was administered to almost all children born in 1921 and attending schools in Scotland on that day (N = 87,498). The

MHT is a well-validated intelligence test that has a high correlation (about .8) with the Stanford Binet. Recent follow-up studies of the SMS1932 (Deary, Whiteman, Starr, Whalley, & Fox, in press) provide novel findings on what intelligence differences during childhood portend for health in the rest of life.

Health data for subsets of the SMS1932 participants were collected in later decades. In one such follow-up study, Whalley and Deary (2001) identified the 2,792 children from the city of Aberdeen who participated in the SMS1932, and searched the Register of Deaths from 1932 to 1997 for whether they were alive or dead on January 1, 1997. Subjects not found were then sought in the Scottish Community Health Index, which records people who are registered with a general medical practitioner (more than 99% of the population). Many women were still untraced, mostly because they had married and changed their surname. Therefore, the Register of Marriages in Scotland was searched from 1937 onward. When a woman was traced to a marriage, the prior searches were repeated. Subjects still untraced were sought using computer and hand searches of the United Kingdom National Health Service Central Register.

Using these procedures, the researchers traced 2,230 (79.9%) of those children who took the MHT in Aberdeen: 1,084 were dead, 1,101 were alive, and 45 had moved away from Scotland. In addition, 562 were untraced. IQ at age 11 had a significant association with survival to about age 76. On average, individuals who were at a 1-standard-deviation (15-point) disadvantage in IQ relative to other participants were only 79% as likely to live to age 76. The effect of IQ was stronger for women (71%) than for men (83%), partly because men who died in active service during World War II had relatively high mean IQ scores. Further analyses of the Aberdeen subjects found that a drop of 1 standard deviation in IQ was associated with a 27% increase in cancer deaths among men and a 40% increase in cancer deaths among women (Deary, Whalley, & Starr, 2003). The effect was especially pronounced for stomach and lung cancers, which are specifically associated with low socioeconomic status (SES) in childhood.

Additional data for many SMS1932 participants are available in the Midspan studies, which began in the 1970s in the western and central areas of Scotland and are still ongoing. These studies investigated cardiovascular and respiratory diseases and their risk factors in the community. The participants were adults who completed a questionnaire and underwent physical examinations. Their social class--based on occupation at midlife--was recorded, as was the degree of deprivation or affluence of the area where they resided. The Midspan studies continue to follow participants, tracking their hospital admissions and the dates and causes of their deaths. Of the 1,251 Midspan participants born in 1921, 1,032 (82.5%) were matched to people in the SMS1932 ledgers, and 938 had an MHT score (Hart, Deary, et al., 2003). Higher IQ in 1932 had strong correlations with both higher social class and greater affluence of the area of residence at the time of Midspan participation. The risk of dying in the 25 years since participation in the Midspan studies increased 17% for each drop of 1 standard deviation in IQ at age 11 (Hart, Taylor, et al., 2003). Controlling for social class and deprivation recorded in the 1970s, when people were about 50 years old, reduced this figure to 12%.

IQ and deprivation interacted, such that the increase in mortality associated with deprivation was greatest in the lowest IQ quartile; put another way, IQ had a larger effect on mortality among people living in deprived areas than among people living in affluent areas at about age 50. Age-11 IQ had a small indirect effect on mortality from all causes combined, through its effects on adult social class and deprivation; however, the direct effects of age-11 IQ on mortality were stronger. Investigating specific causes of death among the Midspan participants, Hart, Taylor, et al. (2003) found that lower age-11 IQ predicted a significantly higher likelihood of dying from cardiovascular disease in general, coronary heart disease, and lung cancer.

Higher intelligence might lower mortality from all causes and from specific causes partly by affecting known risk factors for disease, such as smoking. In the combined SMS1932-Midspan database, there was no significant childhood IQ difference between participants who had ever smoked and those who had never smoked (Taylor, Hart, et al., 2003). However, at the time of the Midspan studies, participants who were current smokers had significantly lower childhood IQs than ex-smokers. For each standard deviation increase in IQ, there was a 33% increased rate of quitting smoking. Adjusting for social class reduced this rate only mildly, to 25%. Thus, childhood IQ was not associated with starting smoking (mostly in the 1930s, when the public were not aware of health risks), but was associated with giving up smoking as health risks became evident.

WHY DOES EARLY INTELLIGENCE PREDICT LATER HEALTH?

Health epidemiologists tend to ascribe inequalities in health to inequalities in socioeconomic resources, and then presume that intelligence is a product of such resources, and thus related to health because it is a proxy for privilege. Do differences in socioeconomic advantage explain the influence of intelligence on health?

Is Intelligence a Proxy for Material Resources?

A robust relation between childhood IQ and late-life morbidity and mortality remains after analyses control statistically for deprived living conditions. Residual confounding is possible, which means that social factors measured to date might not reliably assess all relevant aspects of social disadvantage. However, health inequalities tend to *increase* when health resources become more available to everyone (Gottfredson, in press). That is, increased availability of health resources improves health overall, but the improvements are smaller for people who are poorly educated and have low incomes than for people with more education and better incomes. Compared with people in high-SES groups, people with low SES seek more but not necessarily appropriate care when cost is no barrier; adhere less often to treatment regimens; learn and understand less about how to protect their health; seek less preventive care, even when it is free; and less often practice the healthy behaviors so important for preventing or slowing the progression of chronic diseases, the major killers and disablers in developed nations today.

Yet social class correlates with virtually every indicator of health, health behavior, and health knowledge. The link between SES and health transcends the particulars of material advantage, decade, nation, health system, social change, or disease, regardless of its treatability. Health scientists view the pervasiveness and finely graded nature of this relationship between SES and health as a paradox, leading them to speculate that SES creates health inequality via some yet-to-be-identified, highly generalizable "fundamental cause" (Gottfredson, in press). The socioeconomic measures that best predict health inequality also correlate most with intelligence (education best, then occupation, then income). This means that instead of IQ being a proxy for SES in health matters, SES measures might be operating primarily as rough proxies for social-class differences in mental rather than material resources.

Does Intelligence Provide Health-Enhancing Mental Resources?

Psychometric intelligence is manifested in generic thinking skills such as efficient learning, reasoning, problem solving, and abstract thinking. High intelligence is a useful tool in any life domain, but especially when tasks are novel, untutored, or complex and situations are ambiguous, changing, or unpredictable (Gottfredson, 1997).

Dealing with the novel, ever-changing, and complex is what health self-care demands. Preventive information proliferates, and new treatments often require regular self-monitoring and complicated self-medication. Good health depends as much on preventing as on ameliorating illness, injury, and disability. Preventing some aspects of chronic disease is arguably no less cognitive a process than preventing accidents, the fourth leading cause of death in the United States, behind cancer, heart disease, and stroke (Gottfredson, in press). Preventing both illness and accidents requires anticipating the unexpected and "driving defensively," in a well-informed way, through life. The cognitive demands of preventing illness and accidents are comparable--remain vigilant for hazards and recognize them when present, remove or evade them in a timely manner, contain incidents to prevent or limit damage, and modify behavior and environments to prevent reoccurrence. Health workers can diagnose and treat incubating problems, such as high blood pressure or diabetes, but only when people seek preventive screening and follow treatment regimens. Many do not. In fact, perhaps a third of all prescription medications are taken in a manner that jeopardizes the patient's health. Nonadherence to prescribed treatment regimens doubles the risk of death among heart patients (Gallagher, Viscoli, & Horwitz, 1993). For better or worse, people are substantially their own primary health care providers.

Researchers have concluded that high rates of noncompliance reflect many patients' inability, not unwillingness, to understand and implement the treatments their physicians recommend, especially as regimens become more complex. Many people are unable to perform some fundamental tasks in the "job" of patient, and some researchers have studied this issue using health literacy tests. Although these tests focus specifically on health content, they mimic IQ tests in assessing the same general ability to learn, reason, and solve problems. For instance, one study (Williams et al., 1995) found that, overall, 26% of the outpatients at two urban hospitals were unable to determine from an appointment slip when their next appointment was scheduled, and 42% did not understand directions for taking medicine on an empty stomach. The percentages specifically among outpatients with "inadequate" literacy were worse: 40% and 65%, respectively. In comparison, the percentages were 5% and 24% among outpatients with "adequate" literacy.

In another study (Williams, Baker, Parker, & Nurss, 1998), many insulin-dependent diabetics did not understand fundamental facts for maintaining daily control of their disease: Among those classified as having inadequate literacy, about half did not know the signs of very low or very high blood sugar, and 60% did not know the corrective actions they needed to take if their blood sugar was too low or too high. Among diabetics, intelligence at time of diagnosis correlates significantly (.36) with diabetes knowledge measured 1 year later (Taylor, Frier, et al., 2003). Like hypertension and many other chronic illnesses, diabetes requires self-monitoring and frequent judgments to keep physiological processes within safe limits. In general, low functional health literacy is linked to more illnesses, greater severity of illnesses, worse self-rated health, far higher medical costs, and (prospectively) more frequent hospitalization (Gottfredson, in press).

Most new information about health diffuses through the public media. Like improved access to health care, greater access to health information does not necessarily lead to greater equality. Rather, knowledge gaps tend to grow. When more knowledge about health risks (e.g., smoking) and new diagnostic options (e.g., Pap smears) infuses into the public sphere, already-informed persons learn the most and act on the new information more often than people who started out relatively uninformed (Gottfredson, in press). This might explain why IQ was related to smoking cessation in the SMS1932.

CONCLUSION

The SMS1932 studies have established that psychometric intelligence is an important factor in public health. Major challenges for future research are to identify the causal mechanisms for the relation between IQ and health and to capitalize on the findings to develop programs that will provide more effective health education and health care.

Correlations Have Causes

Four possible mechanisms relating childhood IQ to longevity (Whalley & Deary, 2001) provide a partial research agenda for the field. IQ at age 11 might be (a) an "archaeological record" of prior (e.g., perinatal and childhood) insults, (b) a record of the integrity of the body as a whole, (c) a predictor of healthy behaviors (e.g., avoid injuries, do not smoke), and (d) a predictor of entry into healthy environments (e.g., nonhazardous occupations). In the present article, we have focused on examining the third possibility, conceptualizing health self-care as a job, and cognitive competence as a correlate of performance in that job. However, none of these possibilities is exclusive of the others, and all four need to be considered.

A possible example of IQ as a record of prior insults is that cognitive differences, and risk of illnesses such as diabetes and cardiovascular disease later in life, are correlated with fetal development and birth weight. Investigating the second possibility requires clearly conceptualizing the construct of integrity. For example, oxidative stress (involving the generation of damaging free radicals in the body) is a factor in bodily aging and health. Perhaps people who have low levels of oxidative stress and good antioxidant defenses have better health and cognitive functions in later life than do people with more oxidative stress and poorer antioxidant defenses. Earlier in the article, we noted a confirmatory example of the third possibility: In the SMS1932-Midspan studies, people who gave up smoking between the 1930s and the 1970s tended to have had higher mental test scores at age 11 than people who continued to smoke. However, men with higher IQs were more likely to die in active service in World War II than were men with lower IQs: The association between higher IQ and longer life is not immutable.

With regard to exposure to safe versus healthy environments, the fourth possibility, many social scientists think that inequities in social structures, and perhaps education, are the fundamental causal influences that explain why IQ is related to health. The SMS1932-Midspan studies found that adjusting for occupational social class attenuated the effects of IQ on morbidity and mortality somewhat, but the effects remained significant and substantial. In the same studies, the finding of an interaction between childhood IQ and deprivation on later health attests to the importance of both intellectual and social factors. However, the fact that SES-health correlations have sometimes disfavored higher-SES groups but then reversed direction in a matter of decades (Gottfredson, 2002), as groups differentially sought, understood, and acted upon new health discoveries, speaks against purely socioeconomic (or, indeed, body-integrity) explanations for some of the IQ-health relations found in the Scottish epidemiological studies. It implicates psychometric intelligence as a significant influence on effective health self-care. A key test of the influence of social background will be to examine whether siblings who have dissimilar IQs but are reared in the same family have discordant health and longevity.

Health Education and Health Care

The epidemiological studies we have discussed suggest that health care policy and practice will be more effective if they take into account how cognitive competence influences health and survival. One possibility we have raised is that the cognitive complexities of health self-care exceed the learning and reasoning capabilities of many individuals. Health educators already advocate that health materials be written at no higher than the fifth-grade reading level. However, many aspects of health self-care--for example, self-monitoring and self-medicating among individuals with chronic disease--are inherently complex and perhaps cannot be simplified without rendering care less effective. Health care workers can use this knowledge to help all patients attain optimal levels of skill and knowledge.

Recommended Reading

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