Life, Death, and Intelligence

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"Futures of Intellectual Assessment and Psychometrics"
Symposium held by Peabody College, Vanderbilt University
December 4, 2002

[PPT slide 1-Title]

[2] Many people have the impression that intelligence, as measured by IQ tests, is just an academic ability—that it has little practical value on the job, in the home, or in conducting one's daily business with banks, restaurants, the local health clinic, and so on. Is this true? Is IQ just a narrow academic ability?

[3] No, it's not. IQ tests actually measure the single most useful tool in the toolkit of human mental abilities. Today I will argue that general intelligence affects our personal well-being in many ways throughout the whole course of our lives.

[4-a] I will begin with 5 facts that form the core of my argument, and then turn to various kinds of evidence to illustrate it.

[4-b] The first fact is that all mental tests measure mostly the very same thing. No matter what a test was meant to measure (say, math or spatial aptitude), no matter whether it is given in written or spoken form (or even pantomimed), and whether test items use numbers, words, symbols, or whatever else you can think of, the test still measures mostly the same thing as do all other mental tests.

[5] When it is extracted from a battery of mental tests, this common factor is called the general mental ability factor, or g for short. It is the key active ingredient in all mental tests. Being the most general of all mental abilities, *g* is represented at the top stratum of the hierarchical structure of mental abilities that many of you are familiar with.

[6-a] g obviously has to represent a set of very ***general*** skills in order to be the primary ingredient in so many different kinds of tests. The skills manifested with high IQ include

learning quickly and efficiently, reasoning, thinking abstractly, solving problems, and the like. These are general information-processing skills that can be applied to any kind of content, any kind of problem, at any time, in any place.

[6-b] Indeed, anyone who fails to learn, reason, and solve problems in non-academic settings will be in big trouble because life never ceases requiring us to do all these things. I will provide various kinds of evidence for this later.

[6-c] Not surprisingly, then, we find that g predicts many kinds of life outcomes. Indeed, it is usually a better predictor of success and well-being than is socioeconomic status.

[6-d] However—and this is very important—g's practical value varies greatly depending on what kinds of tasks are involved. Tasks that are more complex and require more information processing put a bigger premium on g. They are referred to as more "g loaded."

[7] To summarize the argument, then, many life domains require us to perform g-loaded tasks. The more complex and more frequent they are, the bigger and more pervasive the disadvantages g-loaded tasks pose for lower-g individuals relative to their more able brethren.

[8] I will be illustrating the role of g in four arenas of everyday life. I'll begin with work, then turn to personal business conducted on a daily basis, and conclude with the two major causes of death in developed nations—chronic disease and accidents.

Although we tend to think of jobs in terms of head vs. hand work, intelligence predicts performance in both kinds of jobs equally well when they are equally complex. Both kinds of jobs require learning, planning, judgment, and the preventing, spotting and solving of problems. I will provide an example and then summarize the research results.

The example is for crafts work and represents a failure to plan and spot problems.

[9-cartoon]

[10-a] As for the research data, meta-analyses show that g is the best single predictor of job performance when we look across the full range of jobs in the US economy. Its average correlation with job performance is substantial at 4-.5.

[10-b] But the research also shows, very importantly, that

[11] jobs differ greatly in their demands for g. The jobs shown in this table range from the highest level, such as lawyer, to about the lowest, packer and custodian, with meter reader and teller near the center. The second column shows the IQ ranges of the middle 50% of IQs for applicants to these jobs, as measured by the Wonderlic Personnel Test. You can see that all jobs recruit their workers from a wide range of IQ, but those ranges fall for successively lower-level jobs. For jobs at the top of the list, the middle 50% of applicant IQs falls between 108 and 128, which corresponds to about the 70th to 97th percentiles of the population. The middle 50% of IQs among applicants for jobs at the bottom of the list lies between IQ 80 and 100, which is the 10th to 50th percentiles. This IQ range is almost two standard deviations below that for attorney and engineer. I have not found any job in the US that routinely recruits its workers from below IQ 80, and federal law prohibits the military from inducting anyone below that level. In fact, for a long time now, the minimum threshold for all the military services has been about IQ 85, because they found that recruits below that level aren't very trainable.

The last column explains why higher levels of g are functionally important in higher-level jobs: differences in g have a bigger impact on job performance in those jobs. The criterion-related validities are only .2 in the lowest level jobs but rise to about .8 in the highest.

[12-a] This table in turn helps to explain that fact, that is, ***why*** g predicts performance better in higher level jobs. These data come from a detailed analysis of the ***tasks*** that jobs require workers to perform and the typical conditions under which they perform them. As indicated at the left, factor analyses show that the major distinction among jobs is in how complex they are

overall. The second column shows to what degree the specific job attributes listed in the remaining columns correlate with the job complexity factor.

At the top of the list you find information-processing skills that are practically synonymous with intelligence: reasoning, updating knowledge (which means learning on your own), and analyzing information. But also notice some of the other attributes that increase the complexity of a job: self-direction (which means ***you yourself*** often have to decide what to do) and lack of structure.

[12-b] This is the level at which you find attorney.

Towards the middle of the complexity scale you find the simpler information-processing skills such as transcribing information rather than analyzing it.

[12-c] This is the level at which you find teller and meter reader.

[12-d] The correlates of simple jobs like packer and custodian include lots of repetition and supervision.

You might ask yourself where you would place parent on this scale.

[12-e] My vote would be near negotiate, coordinate, and instruct, but parenting tasks cover the whole range from high to low in complexity and obviously require a lot of non-intellectual strengths as well. Like love and patience. And more patience.

Many of the tasks that workers are paid to do, like driving, advising, teaching, budgeting, and negotiating, we commonly do for ourselves in daily life. The mental skills that workers must exercise in accomplishing them, like reasoning and analyzing, are no less required when we carry them out ourselves.

[13] Planning and thinking ahead, for example, are often required in everyday life.

[14] I'd like to turn now to the arena of daily commerce. Modern, literate societies require their members to carry out transactions with a wide variety of institutions for many purposes, on a routine basis. Chores like filling out job applications, figuring out how to get from

here to there using bus or train schedules, or maps if we are driving, are part and parcel of negotiating the corridors of everyday life. But these seemingly little things are big hassles for many people.

[15] This next cartoon actually illustrates an important point: the advances created by the top half of the IQ bell curve can make life relatively more difficult for the bottom half. In fact, technological advances are constantly requiring us to learn new things, often rendering old skills obsolete and taxing the abilities of less able individuals.

[16] I got an earful about older relatives when I showed this cartoon to my freshmen last week. Such challenges may amuse you when they concern computers—or annoy you, as the case may be—, but increasingly complex technologies in other aspects of life, such as medicine, which I will talk about shortly, can widen gaps in well-being between the more and the less able. It can also create new obstacles for the old dogs among us, who have increasing trouble learning new tricks when fluid g—our raw mental horsepower—declines, as it tends to do with advancing age.

[17] Let's return to the mundane tasks of daily life and, in particular, to the subset referred to as functional literacy. Concerns about inadequate levels of it in the general population led the U.S. Department of Education to commission ETS to do a large national survey of adults in the 1990s, called the National Adult Literacy Survey. I have listed two items at each of the five score intervals for which NALS results are typically reported. All test items simulate everyday tasks. For example, Level 1 tasks include totaling a bank deposit entry and locating the expiration date on a driver's license. 14% of white adults—one in 7—routinely functions at no higher level than this. This means they are seldom able to perform Level 2 tasks, such as locating a specified intersection on a map or determining the difference between two show tickets.

Jumping to Level 5, both these items require using tables of information. For the first one, you must use a calculator to determine the cost of carpet for a room. In the second, you must

use a table of information to compare the merits of two credit cards. Only 4% of white adults routinely function at this level. If these tasks do not seem particularly difficult to you, it is because you are used to operating at this cognitive level. Most people are not.

I showed you earlier that the major difference among jobs is in the overall complexity of the information processing they require. The same turns out to be true of the NALS items.

[18] Regardless of item content, item difficulty rests on degree of inference required, abstractness of information, and amount of distracting information present. The NALS psychometrically mimics an IQ test in many other ways as well.

[19-a] This item illustrates Level 2 demands. It asks that you look at the trend in quarterly sales and then predict what the next data point

[19-b] —spring sales—will be.

[19-c] It requires only a simple inference and there isn't much distracting information.

[20-a] Compare this with a Level 4 item. It asks the following:

[20-b] "On a Saturday afternoon, if you miss the 2:35 bus leaving Hancock and Buena Ventura going to Flintridge and Academy, how long will you have to wait for the next bus?"

[20-b] If you notice this sentence, that buses run one hour apart on Saturdays, then you will have your answer.

[20-c] If you don't, you have to find the entry for the bus departing that intersection at that hour. However, you will get the wrong answer if you just take the time for the next bus listed.

[20-d] You have to notice that this next bus does not run on Saturdays.

[20-e] This task is much more difficult because it is embedded in lots of irrelevant information and requires matching multiple features of the data in this array—day, time, and intersection.

Recall that almost 40% of white adults routinely function no higher than NALS Levels 1 or 2. One national panel concluded that such individuals don't have the reasoning and problem-solving skills that are, quote, "important for competing successfully in a global economy and exercising fully the rights and responsibilities of citizenship."

[21] Let's turn now to illness.

[22] We all want smart doctors.

[23-a] But it turns out that

[23-b] ***You*** are your ***own*** primary health care provider. Why is that so?

[24-a] The answer becomes clearer when you consider what the major killer diseases are today: heart disease, cancer, and other chronic illnesses. This is how health professionals describe them.

[24-b] They are "slow-acting, long-term killers that can be treated but not cured."

[24-c] Self-care is *at least* as important as medical care.

[24-d] And effective self-care requires us to continually learn, reason, and solve problems.

[24-e] In other words, chronic illnesses are very much like careers—never-ending ones that can also become more cognitively demanding with age.

Your health obviously depends on more than your intelligence, but *g* may be more important than most people realize.

[25] Chronic diseases require us to exercise lots of foresight and take steps to ***prevent*** them. We need to stay informed about what makes for a healthy diet and lifestyle, what preventive exams such as Pap smears we need to get on a regular basis, and whether particular symptoms are serious enough that we shouldn't put off seeing a doctor.

[26-a] If you think about it, we get most of our health information from the mass media, not our doctor—whom we seldom see and with whom we converse even less. This article

appeared in my local newspaper last week. Delaware is concerned here that a third of its diabetics do not know they have the disease.

[26-b] Media campaigns like this one attempt to teach the public a bit about what the disease is and why it is serious,

[26-c] what symptoms to watch for,

[26-d] who is most at risk,

[26-e] and, very importantly, how to take action.

[27] Chronic diseases also require a lot of self-regulation on a daily basis. Like many chronic illnesses, diabetes requires patients to follow a daily regimen to manage the disease. But that regimen is not a simple recipe that can be mechanically followed. Patients have to exercise a lot of judgment. With diabetes, many patients have to monitor their blood glucose levels during the day and adjust their diet, medication, and physical activity accordingly. Good self-regulation is essential because it can slow the progress of the disease and limit the damage it does.

[28-a] This table illustrates one reason brighter individuals are better able to manage their disease. The data are from a study of health literacy, which is essentially functional literacy applied to health matters—such as understanding an appointment slip or directions for how many doses of a prescription medicine to take per day. The table provides data for a sample of insulin-dependent outpatients in a large urban hospital. It shows the percent of these diabetics who do not know some of the most elementary facts about their disease. The numbers are shocking.

[28-b] High blood sugar levels pose no short-term danger, but when frequent they can lead to blindness, amputation of limbs, and damage to many other organs. As the first two rows of the table show,

[28-c] 40% of diabetics with very low functional health literacy did not know the signs of high blood sugar,

[28-d] and even more did not know that exercise can bring it back down.

[28-e] Low blood sugar, on the other hand, can precipitate a life-threatening emergency if the patient does not recognize its early signals and react swiftly by eating something appropriate.

[28-f] The last two rows reveal distressing data on this score too.

[29] And as if this were not worrisome enough, medical treatments are becoming ever more complex. Take heart disease, example. It used to be that if you had a heart attack, the hospital sent you home with little more than a pat on the back and a wish for "good luck." Today, however, many patients go home with a complex regimen of multiple medications with different doses and schedules, a new diet, an exercise program, and much more besides. How well a patient understands and implements this regimen can make the difference between controlling the disease and spiraling down into disability and death.

[30] I will say only a bit about accidents, but you can probably predict by now what it will be.

[311] We all want safer products, safer roads, and smart pilots.

[32] But life is full of hazards that

[33] ***we*** have to protect ***ourselves*** from.

Injuries are the third leading cause of death in the US, surpassed only by cancer and heart disease.

[34-a] Take motor vehicle fatalities. They account for half of all accidental deaths in the US. A large longitudinal study of veterans in Australia found that IQ was the best predictor of mortality by middle-age.

Men of somewhat below average IQ had a motor vehicle death rate that was

[34-b] twice as high as for men above IQ 100, and men in the lowest IQ range—that is, the lowest that the military accepts—had a rate three times as high. The authors speculated that the less able men had greater difficulty estimating risk.

[35-a] The large literature on industrial and other accidents makes it clear that the real question about accidents is not what ***causes*** them, but what ***prevents*** them or limits their damage. One comes away from that literature realizing that life is one long exercise in "defensive driving." Models of accident prevention note that we must first recognize the hazards surrounding us—the accidents waiting to happen. For example, consider ice on your sidewalk, a sleepy spouse smoking in bed, and knives, matches, or medications within reach of small children. You must take action to prevent these incubating hazards from erupting into accidents. And if an accident ***does*** occur, you must react quickly—like calling 911—to limit its severity and the damage it does.

[35-b] This process of preventing, limiting, and recovering from accidents is essentially the same cognitive process that is involved in preventing, limiting, and recovering from chronic disease.

[36] It also resembles the cognitive demands of complex jobs. This is clearly illustrated by yet another set of job analysis data, which shows that complex jobs tend to require continued learning, reasoning, dealing with unexpected situations, reacting swiftly to them, and the like.

[37-a] So, what does all this mean for the future of assessment? I would emphasize two points.

[37-b] First, we might develop simple psychometric instruments to help service providers unobstrusively assess people's capabilities for self-care. Face-valid, authentic assessments similar to the NALS and health literacy scales could be useful in hospitals and other institutional settings, especially ones serving populations with many less able individuals, such as the elderly.

[37-c] Second, we ought to be assessing ***tasks*** too, not just people. We need to figure out which life tasks are inherently complex and which are not. When they are inherently complex—as we saw with regulating a chronic illness—service providers can adjust their help to better

accord with the cognitive capacities of their clients. When the complexity is unnecessary, it can be reduced or eliminated.

[38] This example would probably top most of our lists.

[39-a] And so would this, I suspect. It is the back of a packet of over-the-counter cold medicine that I found at home. It breaks all the rules of communicating effectively with patients.

[39-b] For instance, it presents just one thick glob of text.

[39-c] It does not clearly chunk information into meaningful units with clear headings.

[39-d] It uses difficult vocabulary.

[39-e] It does not highlight the most crucial information, such as warnings. In short, it is needlessly complex and off-putting.

There are new standards now for labeling, but this old label is a metaphor for the sorts of obstacles that complexity strews in the paths of less able persons every day. For example, many patients have trouble understanding what their doctors tell them, face-to-face during office visits—unbeknownst to the physician—, and as a result they do not follow the prescribed treatments effectively, if at all.

To conclude, psychometricians have contributed much to educational practice and employee selection. Perhaps they could help protect lives as well.

[40] Thank you.

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